RAILROAD GAZETTE

FRIDAY, DECEMBER 6, 1895.

CONTENTS

Contributions.

Compound and Simple Locomotives in Service.

Richmond Locomotive and Machine Works,
RICHMOND, Va., Nov. 26, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to my communication of Nov. 16, 1895, published in your issue of Nov. 22, and the statement therein that we had furnished the C., C., C. & St. L. Railroad with a compound locomotive in 1893, it now happens that I have before me a comparison of the working of this engine for August, 1895, with 12 simple engines of the same build. This was furnished to me by Mr. Wm. Garstang, S. M. P., in connection with work we are doing in converting some of his engines from simple to compound, but it will interest you as bearing upon "long service tests," for all of these 13 engines have been at work for two years. Not to burden you, I have simply taken the average of the 12 simples, though I can send you a detailed report if you care for it.

C., C., C. & ST. L. RY.—12 SIMPLE ENGINES AND RICHMOND COMPOUND NO. 472. AUGUST, 1895.

Engine number.	Size of cylinders.	Miles run.	Lbs. coal consumed.	Miles run to 1 ton coal.	Number loaded cars hauled 1 mile to ton coal.	Pounds coal per loaded car hauled 1 mile.	Number loaded cars per train.
Average 12 engines..	19 in. × 24 in.	3,464	316,333	21.90	595.4	3.96	23.1
Compound No. 472..	19 in. & 30 in. × 24 in.	3,061	208,000	29.43	691.6	2 89	23.5
In favor Richmond compound No. 472				34.3%	36 8%	27%	1·73%

You will notice that the compound is saving at the rate of upward of 1,000,000 lbs. of coal per annum, which has been about its average all along.

W. R. TRIGG, *President.*

Design of Small Stations.

NOV. 25, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Aug. 9, 1895, on page 530, appears an editorial, "A Failing Case in Station Design," in which the arrangement of some of the prominent railroad stations of the country are severely criticised, and not without just cause. I have lately been reading this article, and it has brought to my mind the manner in which many of our smaller stations are designed.

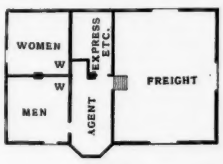


Fig. 1.

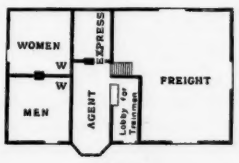


Fig. 2.

Referring to Fig. 1, these stations are usually aranged with two waiting rooms at one end, one for men and the other for women. The other end is occupied by the freight room. Intermediate is the office for the agent and for express, etc. Access to the agent's office is through the men's waiting room by means of a suitable door, usually arranged also for a ticket window.

Let us enumerate some of the disadvantages of this plan:

Where the trainmen have to call for orders, say, for a passenger train, the engineman and conductor have to force their way through the crowd of passengers (and others, usually loafers) in the waiting room, enter through the door mentioned above, which is then usually left open, giving access to the agent's office, and which many times is taken advantage of by those who have no business there. The same objection applies in cases where the agent is obliged to leave his office and go out on the platform. He must perforce pass through the crowded waiting room, there being no other method of egress, if we except the way through the freight room, which is not always practicable. People having business with the agent have to transact it in public, *i. e.*, in the waiting room. Taking in all its phases, the arrangement is a decidedly inferior one.

In order to afford a relief from these many inconveniences, the addition of a small lobby in Fig. 2 served a useful purpose. Instead of the door between the waiting room, we merely have a ticket window, similar to the one in women's room. Access to the lobby is obtained by a door at the right of the bay window. A suitable counter is provided for use of trainmen, persons having business with agent, etc. A door also connects the office and lobby. This arrangement provides absolute privacy, and the company's business is not heralded to all the world as by the other plan. PROGRESS.

American Society of Mechanical Engineers.

The following are abstracts of some of the papers presented at the convention of the American Society of Mechanical Engineers, held in New York this week.

EFFECT OF TEMPERATURE ON STRENGTH OF WROUGHT IRON AND STEEL—BY PROFESSOR CARPENTER.

The investigation described in the following pages was conducted in the spring of 1895, in the Testing Laboratory of Sibley College, being largely a thesis investigation of O. R. Wilson and R. L. Gordon.

The tests were performed on an Emery testing machine, having a maximum capacity of 200,000 lbs. This machine is of the horizontal type, and was built by William Sellers & Co. for the Columbian Exposition, 1893.

The method employed in making the tests differed from that employed in ordinary testing, simply in the provision for heating the test-piece to a specified temperature and maintaining it at that point throughout the test. Various schemes were tried before a successful method was found. The methods of heating tried at first involved the use of a vessel filled with oil or some metal having a low melting point so that it could be maintained in a liquid condition, which surrounded the test-piece and was situated so that it could be heated to, and maintained at, the desired temperature for a considerable length of time. Difficulty with leakage at stuffing boxes finally led to the adoption, as a substitute for the liquid, of a solid block of cast-iron made in two halves and held in position by clamps. This block was heated externally and transmitted its heat to the test-piece. The temperature was measured by a mercurial thermometer, the upper part of which was filled with nitrogen to prevent vaporization of the mercury at high temperatures; it was graduated to 900 degs. Fahr. The bulb of the thermometer was put in direct contact with the test specimen, and was partly surrounded by the solid metal of the cast-iron jacket. The length of the jacket was about 2 in. greater than the gaged length of the test specimen.

The iron jacket when in position on the test specimen was heated by a Bunsen burner having four jets. This method of heating the test-piece proved very satisfactory and, as will be seen by consulting the tables and curves, gave very uniform results.

The specimens tested were turned to dimensions, and those belonging to each class, wrought iron, tool steel, and machinery steel were as nearly uniform in quality as could be obtained from the stock in Sibley College.

About thirty specimens of wrought iron were tested and about twenty-five of steel, the temperatures varying in each test from 22 degs. to 825 degs., the lowest temperature being obtained by use of a freezing mixture, the highest temperature as explained. The method of heating the specimen prevented the use of appliances for measuring extension while under stress, so that information could not be obtained regarding the elastic limit or modulus of elasticity.

Results.—The general results of the test are shown on the curves, Fig. 1, accompanying the report, from which it will be noted that all the curves have a point of contra-flexure at about 70 degs. Fahr. and another at a temperature not far from 500 degs. The maximum strength is found at temperatures of 400 to 550 degs. Fahr. At temperatures higher than this, all the materials show a rapidly decreasing strength. The variation in strength with change of temperature is marked; thus, for instance, with wrought iron, if we represent the strength at temperature at 75 degs. Fahr. as 100, that at from 22 degs. to 25 degs. is 103 to 104, at 500 degs. Fahr. is 126, while at 825 it would be represented by 80.7, which is 63 per cent. of the maximum strength; beyond this point the strength steadily decreases.

The curve for tool steel has the same general form, the temperature of maximum strength being, however, about 400 degs. That for machinery steel is similar, but no experiments were made at low temperatures, and no critical point was observed.

The elongation in 8 in. of length for the tool steel and wrought iron, is shown on the curves in Fig. 2, from

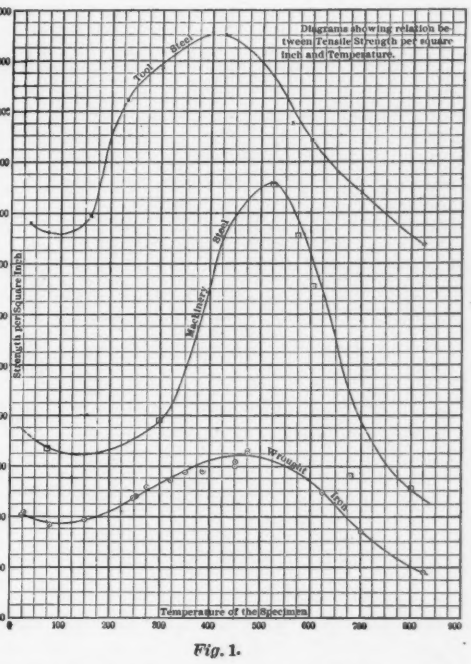


Fig. 1.

which it is noted that these curves are of the same general form, and agree in showing smallest elongation when at a temperature about equal to the boiling point of water. There is considerable variation in the results given by individual specimens, especially for the tool steel; and there is, for this reason, doubt as to the exact

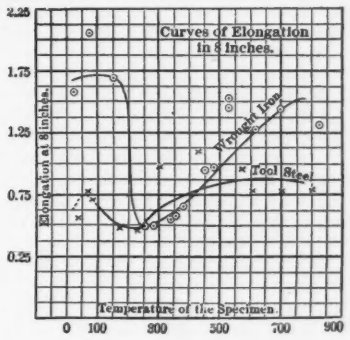


Fig. 2.

position and form of the curve. A large portion of the discrepancy is no doubt due to the methods which had to be employed in measuring the elongation.

SAVING FUEL IN A LARGE OIL REFINERY—BY DR. EMERY.

What follows is an abstract of Dr. Emery's paper concerning a study of conditions existing in the large oil refinery of the Tidewater Oil Co., Bayonne, N. J., the study having been undertaken with a view to adopting means for saving fuel. The amount of steam required is very great, it being used for various engines throughout the works, operating barrel, can and box factories; for steam pumps for transferring oil, water, etc.; for steam and hydraulic presses, and for electric lighting. A very large part is used for heating the oil during the process of refining. The boilers, 5,500 H. P., in four separated boiler houses, were forced much beyond their capacity most of the time. The coal consumption for steam was about 64,000 tons yearly plus a very large amount used directly under oil stills. The officers of the refinery had effected some saving by separating the boilers for two different departments in the refinery, holding each responsible for its own consumption. Steam connections between the various boiler houses were also simplified. A plan to erect a central electric plant and to substitute alternating motors for all steam engines in the works had been suggested, the large cost of which led to the examination into the conditions and the subsequent saving by the methods described below. Experiments made by the refinery officials to ascertain the cost of steam power with ordinary steam pumps resulted in the discovery that many of the steam pumps were using as high as 240 lbs. of water per net horse hower per hour. Cases in which a horse power was delivered with as low as 80 lbs. of feed water were exceptional. The average was 150. The exhaust steam was utilized to some extent to keep stills and tanks warm in winter.

Dr. Emery's preliminary report discouraged the plan for a large electric plant, but suggested a smaller one to reach various outlying points to which steam was transmitted a long distance at great expense, it being necessary to keep the pipes warm all the time, although the power at many points was used only occasionally. The report recommended an extension of the use of exhaust steam, even if back pressure were increased. The substitution of good high-pressure, non-condensing engines,

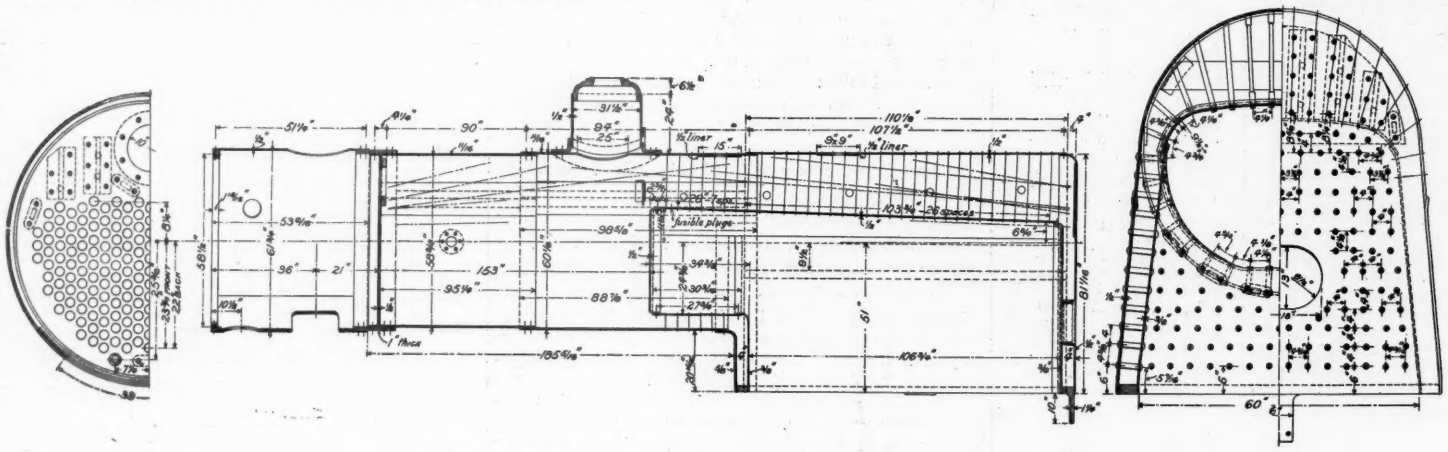
operating power pumps, for the numerous steam pumps throughout the works, the exhaust from such engines to be used for heating purposes, was advised. Evidently if all the exhaust would eventually be required, a cheap form of engine could be used; if not, good compound condensing engines could be put in at some points. The changes were made slowly to gain information by experience.

The work done up to the present is: Local plants operated by high pressure steam engines and power pumps have been placed at two points where the least exhaust steam is needed. The exhaust from nearly all the engines and many wasteful pumps is used at about 10 lbs. pressure in the steam stills, the results showing that early all of it could be utilized. The results have been a reduction of the coal consumption for steam purposes of one-half, or about 32,000 tons yearly. This saving has increased from the time the work was begun, and for the past three months has been 54 per cent., compared with the previous year, although the entire improvement is not completed. One of the four boiler houses has been closed. Experiments are going on to determine how many more boilers can be shut down without forcing the others above the economical limit.

Before the changes, clouds of escaping steam overhung the yards. None is now visible. The fact that so much exhaust steam could be utilized has somewhat modified the original plans of dispensing with all the steam pumps. At points where there is little condensation due to exposure, evidently the lack of efficiency is of minor importance, as the heat passes on and is utilized for heating purposes. In outlying districts, however, there was a large amount of condensation in pipes and pumps necessarily located out in the air in many cases, to avoid danger from fire. A number of these pumps have been housed so as to save loss by condensation, and power pumps will be substituted for others in another sub-station, thus reducing the surplus of exhaust steam, when improvements will be stopped for a time, until experience indicates the desirability of further change.

The electric plant was given up because it was too expensive and because so much of the exhaust steam could be used for heating purposes, such steam being many times in amount that required to operate the dynamos. It had to be supplied, and if supplied through steam engines, power could be developed with only the extra cost due to heat lost in the performance of work which is comparatively trifling, and the heat lost by radiation during transmission. So long as this was less than the cost of power in the best compound engines, the latter could not be economically used. These considerations made the plan adopted decidedly more favorable, though this is not given as a general rule.

The small electric plant is: A General Electric three-phase alternating system, with one 75 K. W. 550-volt generator running all the incandescent lights previously supplied by three small plants in different parts of the yard. About 60 H. P. of motors at outlying points in units varying from 5 to 30 H. P. are installed. The electric conductors displace about 2,000 ft. of steam pipe of various sizes heretofore kept hot winter and summer. Precautions against sparking have been taken in localities where gases exist. The change has improved the electric lighting and the motors are working satisfactorily.



Details of Boiler and Firebox—C., B. & Q. Fast Passenger Locomotive.

EXPERIMENTS ON THE FRICTION OF SCREWS—BY ALBERT KINGSBURY.

Within the past three years the writer has made several hundred experiments on the friction of metallic screwthreads under the conditions of very slow motion, free lubrication and pressures varying from zero to 14,000 lbs. per square inch of bearing surface.

The results sought were the minimum and the mean co-efficients of friction under these conditions. The tests were made on a set of square-threaded screws and nuts, the "mean diameter" of the thread being 1.352 in., the pitch $\frac{1}{8}$ in. and the depth of the nut $1\frac{1}{16}$ in.

Different screws were made of mild steel, wrought iron, cast-iron, cast-bronze, and case-hardened mild steel nuts were also made of the same metals, except there were none of bronze or case-hardened steel and there was one of brass.

Three sets of tests were made under a maximum pressure of 14,000 pounds, heavy machinery oil, winter lard oil, and heavy machinery oil and graphite being used respectively as the lubricant in the sets. A fourth set was also made under a pressure of 4,000 pounds and with heavy machinery oil as the lubricant. In each set, each screw was tested with each nut successively, the test being made four times and the mean of the values taken.

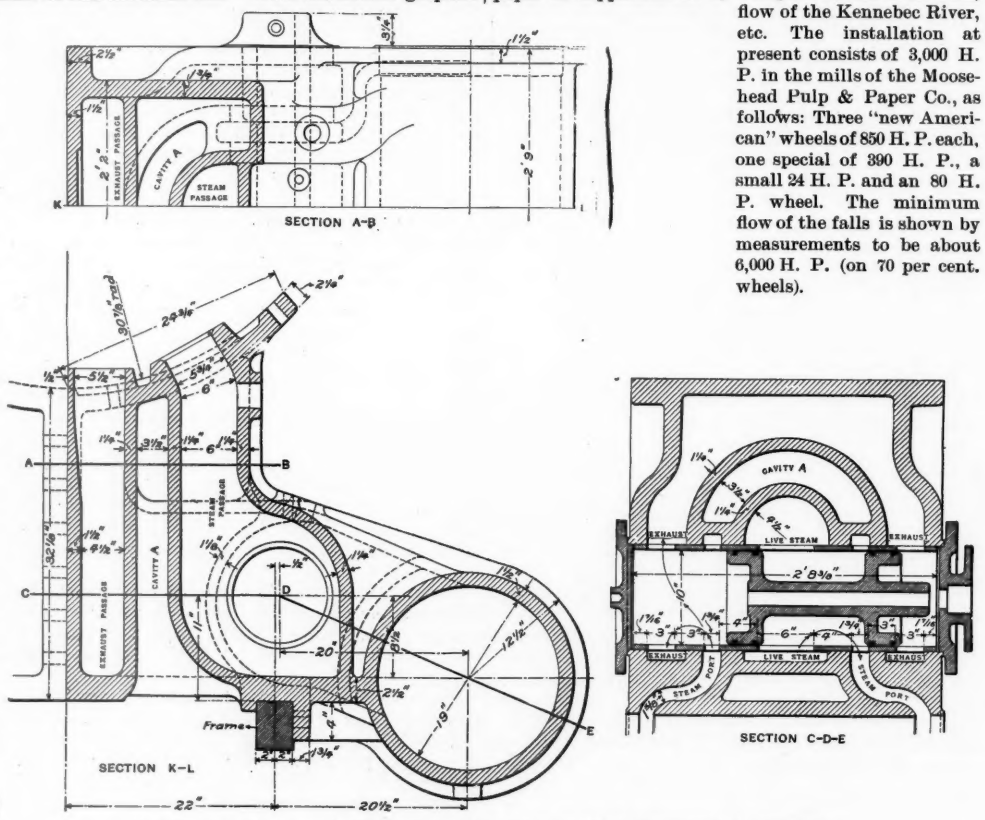
The result of the test is represented graphically, the pencil of an indicator tracing a curve on cards for that purpose. The general form of these curves approximates a straight line, with small irregularities throughout. The curvature is usually in the direction indicating a smaller co-efficient at higher pressures; a straight-line card would indicate a constant co-efficient, or "friction proportional to pressure."

The conclusions which the results of the tests seem to warrant are:

That for metallic screws in good condition, turning at extremely slow speeds, under any pressure up to 14,000 lbs. per square inch of bearing surface, and freely lubricated before application of the pressure, the following co-efficients of friction may be used:

With lard oil as the lubricant the minimum co-efficient is .09, the maximum .25 and the mean .11. With heavy machinery oil, the minimum co-efficient is .11, the maximum .19 and the mean .143. With the oil and graphite in equal volumes, the minimum is .03, the maximum .15 and the mean .07.

The writer does not consider that the tests prove that any one of the metals used develops less friction than any of the others.



Details of Cylinder and Piston Valve—C., B. & Q. Fast Passenger Locomotive.

WATER POWER—SAMUEL WEBER AND SAMUEL McELROY.

Mr. Samuel Weber, Charlestown, N. H., read a paper on "Water Power, its Generation and Transmission." Mr. Weber has collected a large amount of historical information concerning the use of water power in the United States, including a short history of the development of the turbine. The paper closes with some estimates of cost per horse power per year in three different localities, as follows:

Location of power plant.	Total cost per H. P. per year at wheel.
5,000 H. P. at Concord, N H	$ 8.64
1,835 " " Augusta, Ga.	11.05
2,000 " " Columbia, S. C	9.50

The first of the above instances is the plant of the Concord Water Power Co., on the Merrimac River at Concord, N. H., where an average of 5,000 H. P. is developed from 22 ft. fall by "Rodney Hunt" turbines. The author estimates that the cost, $8.64, would be increased to only $10 per horse power by the expense of transmitting the power by shafts and belts to works near at hand. In the calculation the minimum flow of water is assumed to be 3,300 H. P. Taking the average flow, the cost of power at the wheels would be only $5.72, but an auxiliary steam plant would then be necessary. The second case is at the mill of J. B. King, Augusta, Ga. The estimated horse power is gross, the net horse power being 1,068. The head is 40 ft. The power is developed by three Geyelin turbines on vertical shafts with beveled gears. In the third case, that of the Columbia Mills at Columbia, S. C., the fall is 27 ft., the power being generated by Victor turbines on horizontal shafts. It is transformed into electrical energy before being transmitted to the mills. In all these estimates the cost of water rents, attendance, oil, etc., are included.

Another paper on a similar subject was that on "Water Power of Caratunk Falls, Kennebec River, Me.," by Samuel McElroy, of New York. Mr. McElroy records an analysis of the possibilities of utilizing these falls for the development of power, made by him in 1889. The paper is supplemented by complete tables of rainfall, flow of the Kennebec River, etc. The installation at present consists of 3,000 H. P. in the mills of the Moosehead Pulp & Paper Co., as follows: Three "new American" wheels of 850 H. P. each, one special of 390 H. P., a small 24 H. P. and an 80 H. P. wheel. The minimum flow of the falls is shown by measurements to be about 6,000 H. P. (on 70 per cent. wheels).

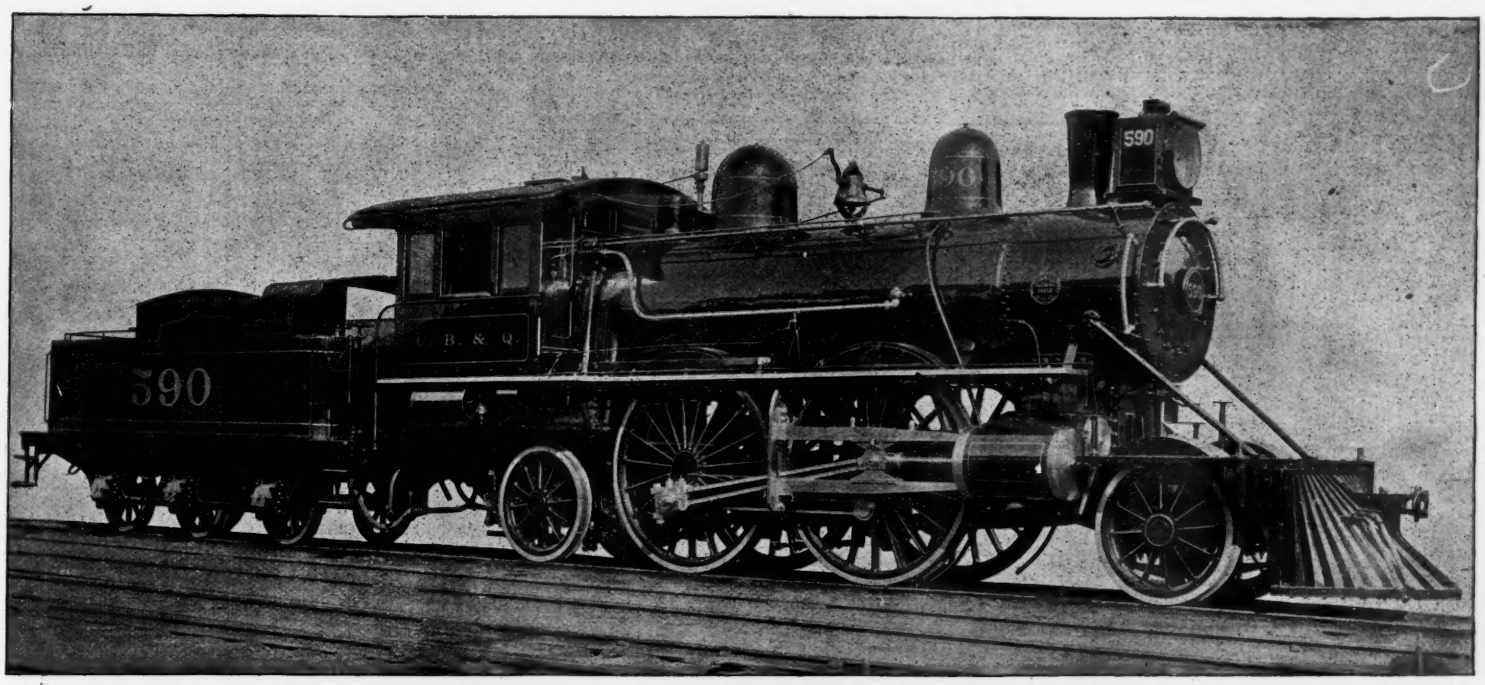
The reports of Holyoke tests, and the comparative costs of different water power plants, with which Mr. McElroy closes his paper, are interesting.

The Chicago, Burlington & Quincy Fast Passenger Locomotive—Class N.

Through the courtesy of Mr. G. W. Rhodes, Superintendent of Motive Power of the Chicago, Burlington & Quincy Railroad, and Mr. A. B. Johnson, of the Baldwin Locomotive Works, we are enabled to illustrate the fast passenger locomotive recently built by the Baldwin Locomotive Works for that road. This engine is designed for very heavy fast service, and is more especially intended for any emergencies that may arise in the future than to handle the trains which are now worked. The class "H" engines of the road are capable of hauling the trains now run, but would not be equal to the work should a much heavier service be required. The general dimensions of this engine were decided on by Mr. Rhodes

and Mr. Wm. Forsyth, but the design and details were left to the Baldwin Locomotive Works.

Fig. 1 is a photograph of the engine and tender. It is of the "Columbia" type, so called from the engine "Columbia" exhibited at the World's Fair by the Baldwins. The neat appearance and graceful design are at once noticeable. The driving wheels are 84¼ in. in diameter over tires, the largest in use on any Western road. They

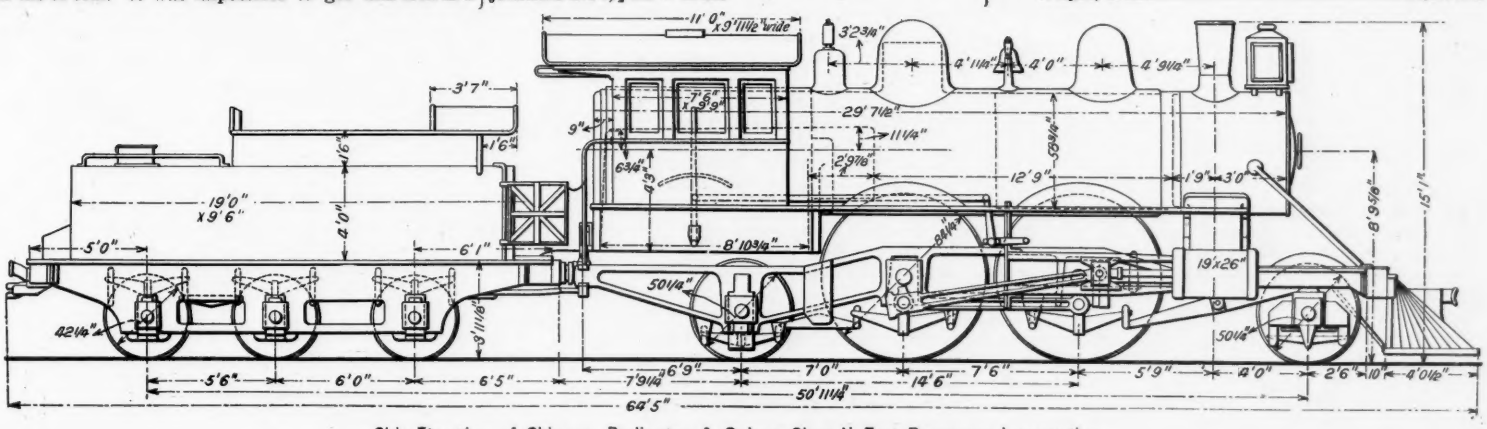


CLASS N FAST PASSENGER LOCOMOTIVE ON THE CHICAGO, BURLINGTON & QUINCY.

Mr. GODFREY W. RHODES, *Superintendent of Motive Power.* *Built by the* BALDWIN LOCOMOTIVE WORKS, *Philadelphia, Pa.*

are larger than any in this country, with the exception of a few engines on Eastern roads, one of the most notable being No. 999 on the New York Central. The single driver engine No. 385 on the Philadelphia & Reading, illustrated in the *Railroad Gazette* of August 9, has drivers of the same size as No. 590.

The most novel feature in the design of this engine is the firebox, which is shown in Figs. 2 and 3. This is 106¾ in. long inside, and 60 in. wide, with a grate area of 44.47 sq. ft. To obtain this width without resorting to the Wooten type is possible in the "Columbia" design, in which the driving wheels are placed in front of the firebox, and two smaller trailing wheels are employed, thus permitting the extension of the firebox over the frames. This firebox was mentioned in Mr. J. Snowden Bell's paper on "Wide Fireboxes," read at the October meeting of the Western Railway Club. The reason for selecting a firebox of such a large area was given by Mr. Forsyth in his remarks before the club—(see *Railroad Gazette*, Nov. 29)—and came from the desire to get a rate of combustion of between 100 and 125 lbs. of coal per square foot of grate per hour. It having been previously determined that the total coal per hour burned by the class "H" engine in hard service was about 5,000 lbs., it was necessary to employ a large grate area to reduce the rate per square foot; and using this figure, 5,000 lbs., for the total coal per hour, the rate of combustion will be about 111 lbs., which is considered good for the economi cal use of coal. It was impossible to get this erea in a



Side Elevation of Chicago, Burlington & Quincy Class N Fast Passenger Locomotive.

firebox between the frames except by an increase in length, which would be out of all question. A combustion chamber, 34⅜ in. long and 35⅝ in. high, is put in to increase heating surface. This engine has not been in service enough to show positively whether this belief in increased economy is justified.

The cylinders, as seen by Fig. 1, are also different from those on most locomotives, the absence of the usual steam chest on top of them striking the eye of the observer at once. This is due to the fact that piston valves, placed between the cylinder, are employed instead of the usua slide valve. A detail of them is shown in Fig. 4. The diameter of the cylinders is 19 in. and stroke 26 in. The center line of the valve is only ¼ in. outside the center line of the frame, and the valve stems are consequently between the drivers and not shown in the photograph. This valve is 10 in. in diameter, and works in a bushing through which the ports are cut. The steam ports are 1¾ in. wide and 21 in. long; and the exhaust port 6 in. wide, with a length of 25½ in. The inside lap is 1 in and outside lap is ¼ in. On account of the valve being of the piston type the laps, inside and outside, have, of course, the reverse meaning to that in the ordinary slide valve. The running board extends out over the cylinders instead of ending at the steam chests, which is also customary practice.

The general dimensions of the engine are given in Fig. 5. The weight on drivers is 86,000 lbs., on truck 20,000 lbs., and on trailing wheels 31,800 lbs., making a total weight of 138,000 lbs. The heating surface in the firebox is 150.61 sq. ft., combustion chamber 36.79 sq. ft., tubes 1,392.72 sq. ft., and total 1,580.12 sq. ft.

The boiler is made of flange plates of homogenous cast-steel 11/16 in. thick, all longitudinal seams, butt jointed with double covering stripes caulked inside and outside. It is 58¾ in. outside diameter at smokebox end. The crown sheet is ½ in. thick and side sheets of the firebox ⅜ in. thick. Both front and back tube sheets are ½ in. thick. The crown sheet is supported by radial stay bolts 1⅛ in. in diameter, screwed through crown sheet and roof of boiler, and riveted over. All 1⅛ in. and 1 in. stays have ¼ in. hole, 1¼ in. deep, drilled from the outside.

The frames are of hammered iron, forged down at the rear end to permit the extension of the firebox over them. The jaws are protected from the wear of boxes by cast-iron gibes and wedges.

The truck is a center-bearing, swiveling, two-wheeled truck with radius bar. The wheels are steel tired, with cast-steel centers, and are 50¼ in. in diameter. The journals are 6½ in. × 10 in.

The general design of the cylinders and their location with respect to the frame are plainly shown in Fig. 4. The pistons are of the box type, made of cast-iron, with cast-iron snap rings. The piston rods are open-hearth steel, and the packing for both piston rods and valve stems is the Jerome metallic. The cross heads are cast-steel, with bronze bearings. The eccentric straps are brass.

The driving wheels have cast steel centers 78 in. in diameter, and the steel tires are held by shrinkage and retaining rings. The driving boxes are of steeled cast-iron with underhung springs. The main drivers are equalized with the trailing wheels and the front drivers are equalized with the truck. The main and side rods are open-hearth steel.

Two Sellers' injectors, one 9½ and one 10½, Leach's track sanding apparatus, and the West bell ringer are used. The engine is provided with the Westinghouse-American outside equalized brake on driving, trailing and tender wheels. The boiler is lagged with asbestos cement. The whistle is placed on the side of the dome instead of at the same place as the safety valves, as is frequently done.

The tender, as shown by the photograph, Fig. 1, is also a departure from the usual practice of the Chicago, Burlington & Quincy. It has six wheels working in pedestals formed by the plate frames. Leaf springs are used, the two rear wheels on each side being equalized. The tank has a capacity of 4,200 gallons, and the coal space will hold 7 tons. Owing to the length of the tender, the sides of the coal space are sloped in order that the coal may always be within easy reach of the fireman. This is quite an important matter, as the fireman is almost continuously employed in shoveling the coal, and the result of the sloping sides is to help him materially in his firing. There is a small roof over that end of the tender in which the fireman stands. The wheels have wrought iron centers, steel tires and are 42¼ in. in diameter. A Janney coupler is used. The following table gives the principal dimensions.

C., B. & Q. LOCOMOTIVE, CLASS "N."

Description.

Type	8-wheel, Columbia
Name or number	No. 590
Name of builder	Baldwin Locomotive Works
Name of operating road	C., B. & Q. R. R. Co.
Gage	4 ft. 8½ in.
Simple or compound	Simple
Kind of fuel to be used	Soft coal
Weight on drivers F., 29,600l bs.; R., 500 lbs.; 46, total, 86,200 lbs.	
Weight on truck wheels	20,000 "
" " trailers	31,860 "
Weight, total	138,000 lbs.

General Dimensions.

Wheel base, total, of engine	24 ft. 3 in.
" " driving	7 " 6 "
" " total (engine and tender)	50 " 11¼ "
Length over all, engine	39 " 4¾ "
" " " total, engine and tender	64 " 5 "
Height, center of boiler above rails	8 " 9⅝ "
" of stack, " "	15 " 1 "
Heating surface, combustion chamber	36.79 sq. ft.
" " firebox	150.61 "
" " tubes	1,392.72 "
" " total	1,580.12 "
Grate area	44.47 "

Wheels and Journals.

Drivers, number	4
" diameter	84¼ in.
" material of centers	Cast steel

Truck wheels, diameter	50¼ in.
Trailing " "	50¼ "
Journals, driving axle, size	8½ in. × 12 "
" truck " "	6½ in. × 10 "
Main crank pin, size	6 in. × 6 "

Cylinders.

Cylinders, diameter	19 in.
Piston, stroke	26 "
" rod, diameter	3¼ "
Kind of piston rod packing	Jerome metallic
Main rod, length center to center	8 ft. 4 in.
Steam ports, length	21 "
" " width	1¾ "
Exhaust ports, length	25½ "
" " width	6 "
Bridge, width	3 "

Valves.

Valves, kind of	Piston valves, 10 in. diam.
" greatest travel	6 in.
" outside lap	¼ in. negative
" inside lap or clearance	1 in.
" lead in full gear	3/32 "
" " constant or variable	Variable

Boiler.

Boiler, type of	Straight
" working steam pressure	200 lbs.
" material in barrel	Steel
" thickness of material in barrel	11/16 in.
" diameter of barrel	58¾ "
Seams, kind of horizontal	Double riveted butt
" " circumferential	" lap
Thickness of tube sheets	½ in.
" crown sheet	½ "
Crown sheet stayed with	Radial stays
Dome, diameter	32 in.

Tubes.

Tubes, number	210
" material	Iron
" outside diameter	2 in.
" length over sheets	12 ft. 9 "

Firebox.

Firebox, length	8 ft. 10¾ in.
" width	5 " 0 "
" depth front	62¼ "
" " back	57¾ "
" material	Steel
" thickness of sheets	5/16 and 5/8 in.
" brick arch? Yes. In combustion cham. water space.	
" width	Front 4 in.; sides 4 in.; back 4 in.
Grate, kind of	Rocking and Drop

Smokebox.

Smokebox, diameter outside	61¾ in.
" length front to tube plate	57 in.

Other Parts.

Exhaust nozzle, single or double	Single, low
" " variable or permanent	Permanent
" " diameter	4½ in.
" " distance of tip above or below center of boiler	Below, 7¼ in.
Netting, wire or plate	Plates and netting
" size of mesh or perforation	Netting meshes, 2½ × 2½ per in., No. 11 W. G.
Stack, straight or taper	Taper
" least diameter	14 in.
" greatest diameter	18 in.
" height above smokebox	36 in.

Tender.

Frame	Steel.
Tank	Steel, ¼ in. plates top, bottom and inside; 5/16 in. outside
Tank capacity	4,200 gals.
Coal "	7 tons.
Weight of tender in working order	86,300 lbs.

The New Goodwin Dump Car.

In the *Railroad Gazette* of July 16, 1886, was described the first dump car made under the patents of the late John M. Goodwin. Since then the car has been greatly improved, but the fundamental principles of dumping the load by gravity only, and of obtaining an opening sufficiently large to permit the free discharge of the load, have been retained.

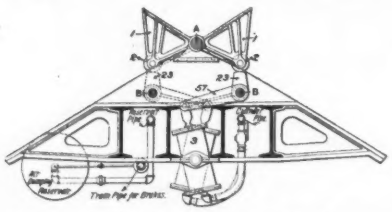


Fig. 4.—Section of Air Dumping Mechanism.

An improved four-wheel car built in 1894 has had a severe trial on the Calumet & Blue Island Railroad. It has been used to handle material for the Illinois Steel Company at Joliet, Ill. This car, with a capacity of 40,000 lbs., has successfully carried and dumped ore, cinder, pig iron, etc., and has been favorably reported on by the officers of the Illinois Steel Company and of the railroad. The only essential change suggested was to make the car of a larger capacity, and it was with this object in view that the new car was designed.

The capacity of this car is 60,000 lbs., and the length over deadwoods is 35 ft. 11 in. The extreme width is 8 ft. 10 in., and width inside 8 ft. 3¼ in. The distance between center plates is 23 ft. 9 in., and the spread of trucks 5 ft.

Fig. 1 is a half side elevation, Fig. 2 is the end elevation, and Fig. 3 is a cross-section. The car body and underframe are designed to be especially strong and able to withstand the rough use to which these cars are subjected. The longitudinal sills, four in number, are 12 in steel "I" beams, 35 ft. long, spaced as shown in Fig. 3. These beams are firmly held together by wrought iron straps placed above and below them to serve the same purpose as the needle beams. These straps are located beneath the end boards, center bulkhead and intermediate between the body bolsters and center, the spacing of the latter, 3 ft. 9¾ in., being shown on Fig. 1. These straps are all bent to the same shape as those in bulkhead section, Fig. 3, and project beyond the sills so as to form a support for the side and corner posts, and aprons of the car. Filling pieces of malleable iron, riveted to both top and bottom straps and to external "I" beams, are put between the projecting ends of these straps to keep them from bending down under a load. Beyond these filling pieces, the top and bottom straps are securely riveted together. The top straps at the ends and center of the car are ⅞ in. × 6 in., the bottom straps being 1 in. × 6 in. Both straps forming the intermediate cross-ties are ⅞ in. × 4 in. The body bolsters are formed of two pieces of wrought iron, placed above and below the "I" beams, similarly to the cross-tie straps (See bolster section, Fig. 3.) The top piece is ⅞ in. × 8 in., and bottom piece 1 in. × 8 in., the projecting ends of the bottom piece being bent to a different form from the bottom cross-tie strap. This is necessary in order to clear the arch bars of the trucks. Malleable iron filling pieces are put in here, not only between the projecting ends of the top and bottom pieces of the bolster, but also between each "I" beam, necessary holes for the air dumping pipes being cut out. The effect of these ties and filling pieces is to bind the longitudinal sills firmly together, and make a strong construction.

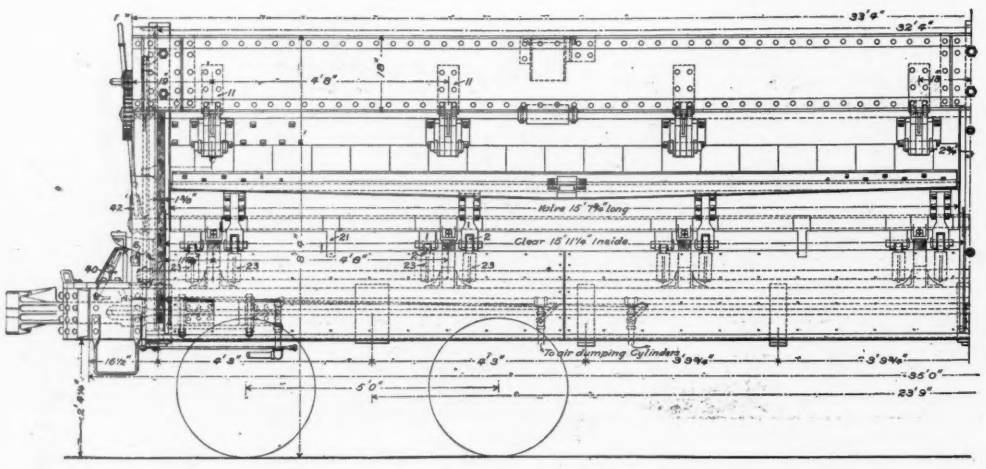


Fig. 1.—Half Side Elevation—Goodwin Dump Car.

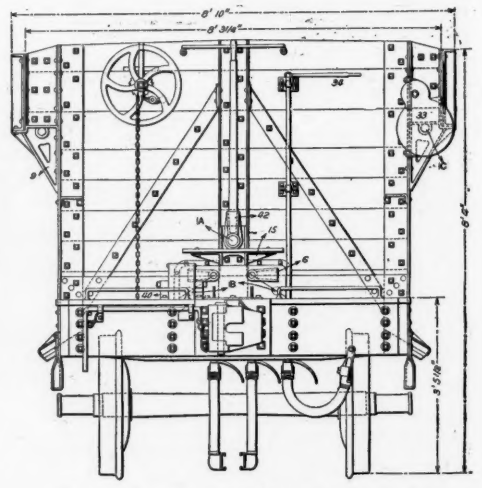


Fig. 2.—End Elevation—Goodwin Dump Car.

The end sills are 12-in. steel channels fastened to the longitudinal sills by 3-in. × 3-in. × ⅜-in. angle connections. The ends of the end sill are on a line with the corner posts, and are braced by short pieces of 12-in. channel butting against the end tie straps and corner posts. A hole is cut out of the center of the end sill to permit the insertion of the drawbar, the center line of which is about midway between the upper and lower flanges of the center sills. This permits the use of the center sills as draft timbers. In the accompanying illustrations the American continuous draft rigging is shown, but this will most likely be changed to some other type. Oak pieces, which may perhaps be called either dead-woods or sub-end sills, are bolted outside the channels forming the end sills.

The car body is also made in a substantial manner. The corner posts are 6-in. × 7-in. × 7/16-in. steel angles, and the ends posts 7-in. steel channels. Side girders of ⅜-in. × 18-in. steel plates 33 ft. 4 in. long carry the top chutes and the hinge brackets for the swinging side valves. These girders are carried at their ends by brackets attached to corner posts, and at the center are held by the bulkhead. All the boards at the ends, center bulkhead and in the valves, are white oak, tongue and grooved. Lateral tie rods 1½-in. × ¾-in. wrought iron hold the side girder together at ends and center. The side posts are held by 1-in. × ½-in. rods, these ties all being put in grooves ploughed out of end and center bulkhead boards. As a still further lateral tie for the corner posts, a 6-in. × 6-in. × 7/16-in. steel angle is laid across the longitudinal sills, resting on the end tie strap before mentioned, and is riveted to corner posts and to the sills, Fig. 2.

The car is divided by a center bulkhead into two sections, and this permits the load to be dumped in six different ways. The load in each section may be dumped, all on right side, all on left side, or half on each side. Each section is entirely independent of the other, and may be dumped as desired. The dumping arrangements are best described by reference to Figs. 3 and 4. The sectional view, Fig. 3, shows the car in its running position. The load is carried by four valves, the two center ones being supported at their inner and lower edges by the central steel rock shaft, *A*, and at their outer edges by malleable iron struts, 1. The two side valves are in turn supported at their lower edges by the center valves, and at their upper edges by link hinges carried by brackets, *II*, attached to the side girders. All of these valves extend from the end of the car to the center bulkhead, with just sufficient clearance to allow their free motion. The removing of the support from beneath the center valve strut permits that valve to drop until it is flush with, and forms a continuance of, the apron. This release of the center valve permits the side valve to swing outward, as shown by the dotted lines, Fig. 3, and the load is dumped without shock. It is thus seen that by the release of either center valve, the load is dumped on the corresponding side, and that where both valves are released simultaneously the load is split and dumped on both sides.

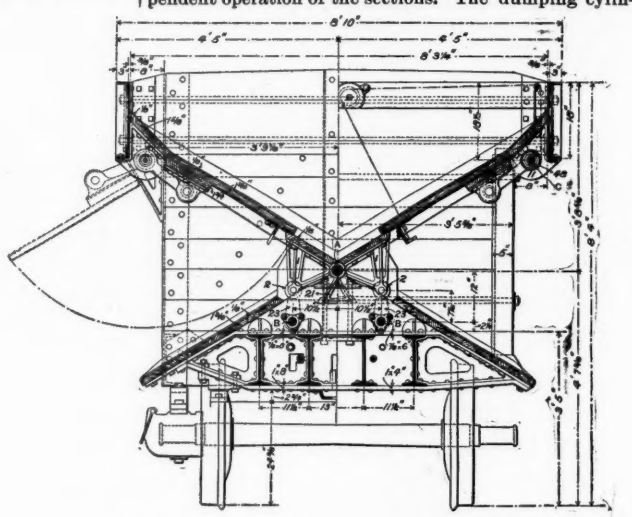


Fig. 3.—Transverse Sections—Goodwin Dump Car.

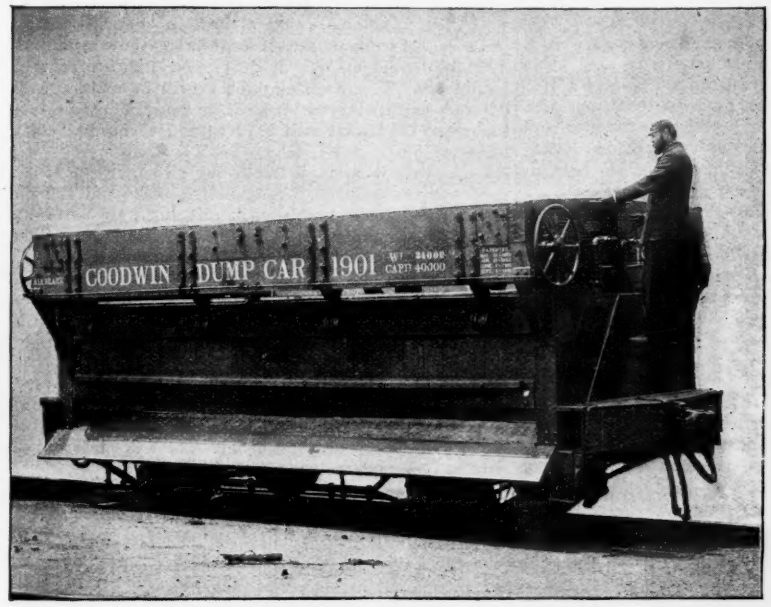
The releasing of these valves is done by compressed air or by hand, the use of the air permitting any number of cars to be dumped simultaneously.

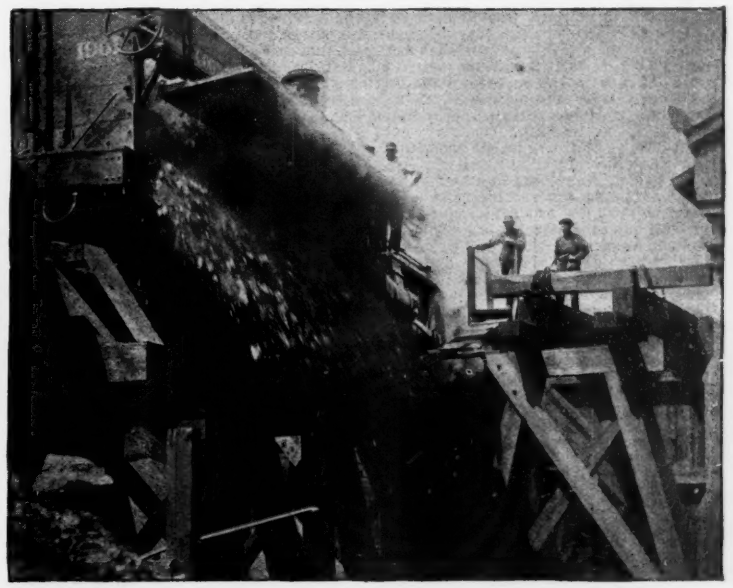
Fig. 4 is a cross-section showing the releasing mechanism. The center valve struts, 1, have small rollers, 2, which rest on detents, 23, carried by the two steel shafts, *B*. The centers of these shafts are directly below the centers of these rollers, and the faces of the detents are arcs of circles, with centers at centers of shafts, *B*. The detents are pinned fast to their shafts, as are also the cylinder levers, 57, and the shafts, *A* and *B*, extend from the end of the car to center bulkhead. This dividing of the shafts at center bulkhead permits the independent operation of the sections. The dumping cylinders, 3, are placed between the center sills, and act directly on the cylinder levers as shown, the admission of air forcing up the lever and removing the detents from beneath the struts. The load in the car is not raised at all, the only work necessary being the overcoming of the friction between the detents and roller bearings on struts.

The cylinders are all connected to a pipe line by hose connections, with cut-off cocks placed before them. These cocks are opened and closed by reach rods attached to small levers enclosed in a box, 40, on the end platform

of car. One cylinder operates each shaft *B*, thus making four per car. A separate pipe line with a standard Westinghouse 33-in. auxiliary reservoir attached, carries the compressed air which is supplied from the air brake train pipe or from the locomotive directly. There is a connection between these two lines at one end of the car, and a cock placed in this cross-over controls the admission of the air. This cock is opened by a single movement of the small lever, 38, placed on the end of the car, Fig. 2, and the air entering the cylinder line operates all the cylinders that may be open.

The cars may be dumped by hand, with a lever placed in the sockets, 6, which operate the detent shafts *B* by means of gears.





The Goodwin Dump Car in Service.

There is no danger of an accidental dump while running as the detent cannot slip from under the center valve strut unless by an application of the air or by the use of the hand levers. This is prevented by making all the levers removable and by placing the levers operating the cylinder cocks in a box that may be locked. It is impossible to close this box unless the levers are in the position which shuts the cocks.

The side valves are replaced by a chain wound around a drum, 48, carried by a shaft which is operated from the end of the car by a rachet and gears. Three gears are enclosed by a malleable iron cover, 33. The center valves are replaced by the triangular casting, 21, which is pinned fast to shaft, *A*. This shaft is rocked by the long lever in socket, 42, shown in Fig. 2.

By means of the replacing chains, the side valves may be lowered gradually instead of dropped, and the load consequently discharged slowly. By this means the load can be distributed along the track while the car is in motion, if it is desirable.

All the valves and aprons are covered with steel plates ⅛ in. thick. The Williams couplers, Westinghouse automatic quick acting air-brakes, and M. C. B. Standard iron axles, journal boxes, brasses, 33 in. cast-iron wheels, etc., are used.

The weight of the car is estimated to be about 35,000 lbs.

It is the intention to build ore cars of special design for any road wanting them, and these will be similar in construction though of shorter length. These cars are put on the market by the Goodwin Car Company, The Rookery, Chicago.

Electric Locking Circuits for Interlocked Crossings.*

BY W. H. ELLIOTT.

In locking electrically the levers of an interlocking machine and taking the control out of the hands of the operator after the route has been set and the signals cleared for an approaching train, the use of the crossing is undoubtedly made much safer, as the operator is then unable to change any of the levers that would lead to a derailment. By locking the levers of the derails only, the operator is free to return any signal to danger at any time and by so doing endeavor to stop a train, should it be a desirable thing to do, but more than this he cannot do. By locking the levers electrically, it is also impossible for the operator to wilfully, or through carelessness, cause any damage to the interlocking by opening a derail or switch for a train or engine to run through trailing the point.

Most probably the first in the field in this country were the Union Switch & Signal Co., who strongly advocated the use of electric locking, a proposition being regularly made in their bids for putting in an electric locking device. Finding, however, that owing to the cost it was seldom or never wanted, they, while believing it was a good thing, have not pushed it to any great extent. The arrangement used by them to lock the lever consisted of an electro-magnet, enclosed in a box and attached to the front of the machine in such a manner, that when the armature was dropped by the opening of the circuit, it would fall into a notch cut in the outer edge of a disk attached to the flop of the lever it was desired to lock, locking it when the lever was reversed, the circuit through the magnet having been broken by the reversal of the lever. To effect a release, a track circuit placed beyond the limits of the interlocking was used, it being so arranged that not until a train had passed entirely off of the circuit and, therefore, out of the interlocking, could any change of the levers be made. For single track crossings, where a train running toward the crossing would release the locks before reaching the interlocking, mechanical interlocking relays were used, which by means of a track locking circuit prevented the completion of the releasing circuit, until the train had passed entirely over the crossing and off the lock circuit. This virtually accomplished all that was desired with any arrangement of circuits, so that the only claim made for the arrangement that I now describe is, that no mechanical interlocking relay is used and the number of circuits has been reduced as much as is possible while accomplishing the end desired.

By doing away with the interlocking relay the releasing is effected entirely by electrical means, and there is no chance of the points sticking and failing to release, nor is there any chance of the locks being released before they should be, by the operator jarring the relay box.

In the arrangement shown in Fig. 1 five different circuits are made use of, one, a track-locking circuit, *T T T*; second, a locking circuit, *L*, used to energize the electro-magnets of the locks and keep them unlocked, and the other three releasing circuits. These are marked *R*, and are used to restore the locking circuit after it has once been broken, thereby lifting the lock armatures and releasing the levers.

The locking circuit, *L*, which, to distinguish it, is shown in heavy lines, is made to pass through tha locking magnet *A*, through the contact points of the armature of the relay, *D*, through the circuit breakers, *B*, the contact points, *P*, of the relay armature, and the locks *K*. Also it may be turned through the releasing switch *S*. The battery, *M*, of about 12 cells, is used to energize the magnet, *A*, and the locks, *K*, whenever the circuit is complete.

The locks being released by the completion of the circuit and the armature of the relay *A* held up, any break in the circuit, as at *D* or *B*, will of course drop the locks and also the armature of the relay *A*, this armature breaking the lock circuit at the point *P*, so that it cannot be restored, even if it were again made good at the point where it had previously been broken. To restore the circuit, the relay *A* must be again energized, when its armature will be lifted and a contact made once more at the point *P*. To energize this magnet (*A*), a shunt circuit through the points of the releasing relay *R* is made use of, which bridges the gap made by the points *P*, and completes the locking circuit from the battery through wire 8 to the relay *R*, to *B* through wire 9, and then through *L* to the magnet *A*. The armature of *A* is thus lifted and the circuit completed once more through the points *P* and the locks.

But as the resistance of the locks is greatly in excess of that of the shunt circuit, not enough current will pass through the locks to energize them, so long as the shunt circuit is complete, and they are, therefore, lifted only after the shunt circuit has been broken. From this it will be seen that by passing the locking circuit through the contact points *P* of the relay *A* and around the locks, the control of the circuit is taken out of the hands of the operator, for while he may break the circuit and lock up the machine at will, he is powerless to unlock, and must wait for the train to pass out of the interlocking (beyond *R*) to release the levers.

The releasing circuits, of which there are three, one for each track on which trains usually pass out of the interlocking, extend only through 60 ft. of the track. The relay *R* is energized and the armature held up so long as there is no pair of wheels on this short piece of track to form a short circuit. When the relay is deenergized by the short circuiting the armature falls and makes a back contact, completing the shunt circuit through the locking magnet *A*, around the locks and restoring the locking circuit in the manner spoken of. The locks are not released until the locking circuit through the points of relay *R* has been broken, so that as long as there is a train on the releasing circuit the machine is locked up. A train must not only have reached there-

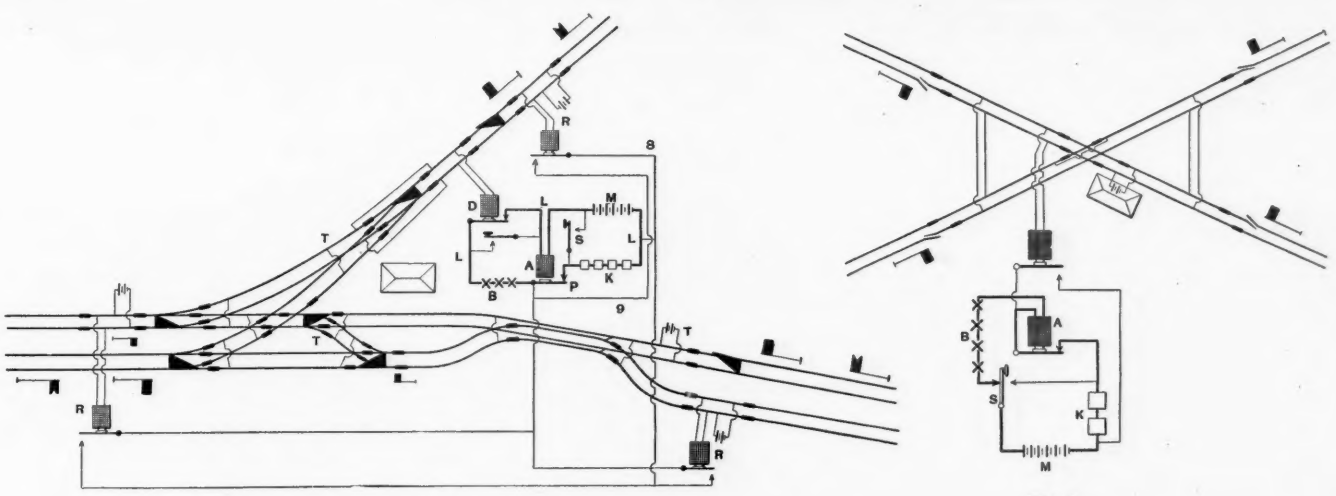


Fig. 1. *Fig.* 2.

Automatic Electric Locks for Switch Levers; Diagrams of Connections.

* A paper read before the Railway Signaling Club, Chicago, Nov. 12, 1895.

leasing circuit but must pass beyond it before the levers will be released.

The track locking circuit, energizing the relay *D*, the armature of which when down is made to break the locking circuit and prevent the locks from being released, is used to prevent a train passing over a releasing section on one track from releasing the locks before a train which may be on one of the other tracks has passed out of the interlocking. In this way an operator is prevented from making a mistake and changing the switches in front of any engine that may be working within the limits of the interlocking and which, for the moment, he may have overlooked.

The circuit breakers *B*, one of which is provided for the lever of each home signal, are used to break the circuit and lock up the machine whenever a home signal is cleared, thus insuring that while the signal may be returned to danger at any time, no change can be made in the switches of the route that had been set. As the locking circuit is the one that is broken when the home signal is cleared, the circuit will, of course, not be restored and the locks will not be released, when a train passes out of the interlocking, if the signal has not been returned to danger before the last car has passed off the releasing circuit. This makes an operator attend strictly to his duties, as otherwise he may be caught with the machine locked up when there is a train wanting to use one of the other tracks of the crossing.

In case of a failure of the circuits to release, a releasing switch *S* may be closed and the levers unlocked. This switch is enclosed in a locked box having a piece of glass set in the cover, which the operator has to break before he can get at the switch to close it, and every glass broken has to be accounted for and a good reason given for the breakage. A second switch, enclosed in another box, which is of the same construction as the first, is provided which, when closed, will do away with the track locking circuit, without throwing the locking entirely out of service. As it is a somewhat difficult matter to maintain a track circuit where there are many pipe and wire lines crossing under the rails, nine out of ten cases of failure being caused by some trouble with the track circuit, the use of the apparatus with this switch closed will be found to give almost the same protection as with the track locking circuit in use, while admitting of the use of circuits that will seldom or never fail. If at any time changes in the rails or repairs to the interlocking are being made, this switch can be closed by the repairman and the locking feature for the greater part be maintained.

The order in which the several operations take place when a train is admitted to and passes over the interlocking is as follows:

When the home signal is cleared the locking circuit is broken by the circuit breaker *B* and the locks and the armature, *P*, of the relay, *A*, are dropped; the armature of the relay, *D*, is also dropped as soon as the train reaches the track-locking circuit. When the train reaches the releasing circuit, *R*, the armature of the releasing magnet, *R*, drops, making a back contact; this completes the locking circuit around the point, *P*, as soon as the circuit is restored at the other points where it has been broken.

If the operator has restored the home signal to danger, closing the circuit at *B*, then as soon as the train passes off the track-locking circuit the relay, *D*, is energized, allowing the relay, *M*, to be energized by the releasing relay when the train has passed on to the releasing section. This completes the circuit at the point *P*, but without lifting the locks. When the train passes off the releasing section, the relay, *R*, is energized, breaking the shunt circuit and forcing the whole of the current to pass through the locks, releasing them. The levers are then once more under the control of the operator.

Where it is desired to lock the levers of a plain crossing interlocking, a much simpler arrangement can be used than the one described, while practically the same results may be obtained. This arrangement is shown in Fig. 2.

As will be seen, only two circuits are used, the track-locking circuit being done away with and the one releasing circuit being made to act also as a locking circuit. All the other parts, the locking circuit, the locking relay, the circuit breakers, the locks, the hand releasing switch and the shunt circuit through the back contact of the releasing relay are the same as with the arrangement first explained. Using only one track circuit and that a releasing circuit, does not change the action of the locks in any way, as the locks are not lifted in either case until the train has passed off the circuit, and practically out of the interlocking.

For very complicated crossings where no switching is allowed without the train passing each time outside of the derails, this arrangement will undoubtedly answer all practical purposes, and, at the same time, be very easy to maintain and cost but little to install. For a plain crossing, the total cost need not be more than $150, although if the crossing was made at a right angle it would probably cost more, a different system of wiring having to be put in.

Skeen's Automatic Crossing Signal.

This signal, used on a number of street railroads, is designed for crossings, but is suitable for any danger point, and may be used to operate an automatic block system.

Referring to the accompanying cuts, Fig. 1 is a perspective of a signal for use at a four-way crossing, with the casing partly removed, exposing the interior and working parts; Fig. 2 is a detail of the locking device, showing the means by which the signal is held in position; Fig. 3 is a diagram showing connections for a crossing of two single track lines; Fig. 4 is a perspective of Skeen's trolley contact.

The signal, Fig. 1, is divided into two compartments—the upper one containing the working parts which operate the semaphore, and the lower one containing the signal lamps.

This signal is operated by a series of solenoid magnets, designated on the drawings as *A A'*. The cores of these magnets are connected by the connecting rod *F F'* to the crank *H*, which is fastened immovably upon the shaft *E*, which extends through a bearing out through the casing and to the outer end of which is fastened the disk. On the inner end of the shaft *E* is fastened the lamp contact bar *C'*. When the current is passed through either of the solenoids *A* or *A'*, it turns the disk *D*, which is normally horizontal, into a vertical position. This action also turns the contact bar *C'* against the contacts *C*, thus lighting the lamp in one of the compartments below.

The signal is held in the position into which it is turned by the locking device shown in Fig. 2. In Fig. 2 the current has passed through the coil *A* and turned the disk *D* from a horizontal into a vertical position. The connecting rod *F'*, which has a slot *G'*, is passed through an aperture in the base and is held down by the shoulder *I'*. It will be seen that it is impossible for the wind or other outside influence to turn the disk back into a horizontal position, as the lower extremity of the connecting rod *F'* will tend to move in an arc struck from the center *E*, as shown by the dotted arrow, and be prevented by the shoulder *I'*. When, however, the current is passed through the solenoid *A'*, and the core *B'* is lifted, the slot *G'* allows the connecting rod *F'* to rise above the shoulder *I'* and be released, as shown by the full arrow.

When the disk is in a horizontal position the magnet core *B* will be down and the connecting rod *F* will extend through the apertute *I*, and the pin in the crank *H* will be at the upper end of the slot *G*, thus locking it in the same manner that it is locked in the other position; thus a positive lock is formed for both positions of the semaphore.

Referring to Fig. 3, it will be seen that the car moving toward the west has passed the contact pan *L*, and by so doing has caused the current to pass to the ground through the coil *A*, which operates the signal, stopping the southbound car. The contact bar *C'* is at the same time turned against the contact brushes *C*, which gives current to the lower lamps, thus showing red to the southbound car and green to the westbound car. The apparatus will remain locked in this position while the car is passing between the pans *L* and *M*. When the car passes the trolley contact *M* the disk will be turned to its horizontal position by the current passing through the coil *A'* (behind *A*) to the ground, and the lamp contact will be broken by removing *C'* from contact with the brushes *C*. After the westbound car has passed the pan *M* at the crossing the southbound car will have right of way and proceed, and, making contact with the pan *L'*, will cause the disk used for blocking the east and west track to assume a vertical position, and the lamp in the upper compartment to be lighted, showing a red light to westbound cars and a green light to southbound cars. This warning position will be maintained till the southbound car passes the pan *M'* at crossing, when the signal will be returned to normal and locked.

For a crossing of single tracks but two pairs of solenoid magnets and their corresponding disks and lights are required; for a double-track crossing four pairs of operating solenoid magnets and four corresponding signals; but the same number of lights are required as before. Fig. 1 shows such a signal adapted for double-track crossings, but the diagram of Fig. 3 is used for simplicity.

A trolley contact or pan especially adapted to operate with this signal is shown in Fig. 4. It consists of a bar upon which is suspended a set of branching springs overlapping one another and approaching, but not touching the trolley wire. The bar is insulated and electrically connected with its proper solenoid A or A'. The trolley passing along the trolley wire by its groove touches these springs and sends a certain and continuous current to the solenoid magnet without impeding the passage of the trolley.

There is a cut-out feature combined with the apparatus which enforces the warning given by the visual signal. It consists of an insulated section interposed in each trolley wire and extending from the crossing to a suitable distance away from same, and corresponding with the distance between the trolley contacts previously described. Each insulated section is wired to a switch operated by the same shafts which cuts the current in and out of the corresponding section in the same manner as the lights are cut in and out, and simultaneously with them. Thus when a car going east reaches its insulated section it will cut out the current from the insulated section of the crossing line, at the same time that it presents a warning signal to that line. The signal may be used with or without the cut-out switch.

This signal is made by the Skeen Electric Switch & Signal Company of St. Louis.

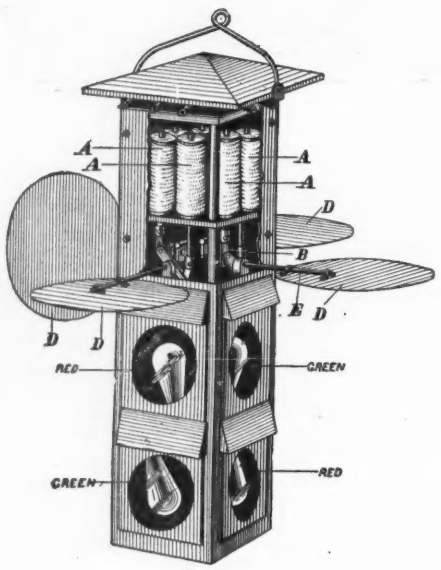


Fig. 1.

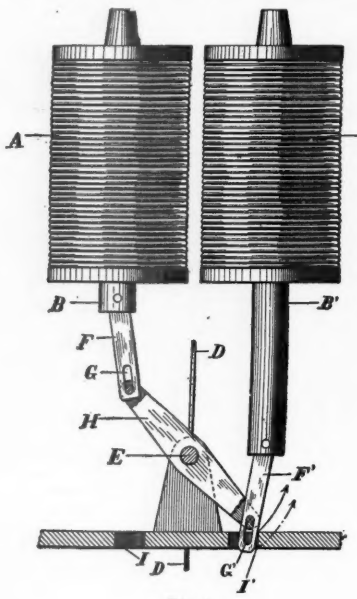


Fig. 2.

Fig. 4.

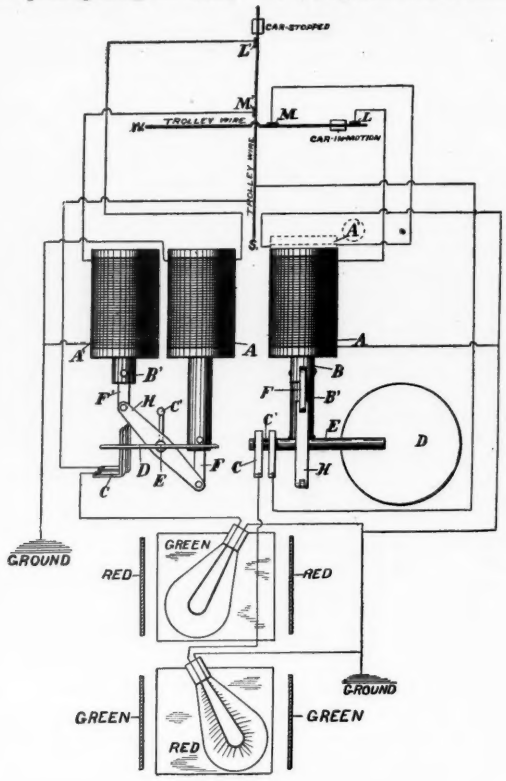


Fig. 3.

Skeen's Automatic Signal for Electric Railroad Crossings.

Tests of A Ten-Horse-Power De Laval Steam Turbine.*

BY PROF. WILLIAM F. M. GOSS.

The de Laval steam turbine experimented upon constitutes a part of the permanent equipment of the Engineering Laboratory of Purdue University, and the present paper is based upon data secured chiefly through the assistance of Charles E. Bruff, B .M. E.

* A paper presented at the New York meeting (December 1895) of the American Society of Mechanical Engineers.

In the de Laval steam turbine, jets of steam, delivered from suitable nozzles, are made to impinge against the buckets of a light turbine wheel. The steam enters the buckets from one side of the wheel, and passing through, is discharged or "exhausted" from the opposite side. The arrangement of nozzle and wheel is shown by Fig. 1. The motion of the turbine shaft, which, under the action of the jets, is extremely rapid, is communicated by gearing to a heavier and slower-moving driving shaft carrying a fly-wheel of small diameter; from this wheel the power of the engine is delivered. Regulation of speed is secured by means of a throttling governor, which controls the pressure of the steam admitted to the nozzles.

The important moving parts, with approximate dimensions, are shown by Fig. 2. The turbine wheel is built of of sixty-three steel segments, each carrying a bucket and a portion of the light outside rim. The segments are held in place by means of suitable collars, which grip them on either side. The wheel is mounted upon a long, slender shaft, having sufficient flexibility to allow the system at speed to revolve about its center of gravity, even though this may not agree with the geometrical axis of the shaft. The gear upon the turbine

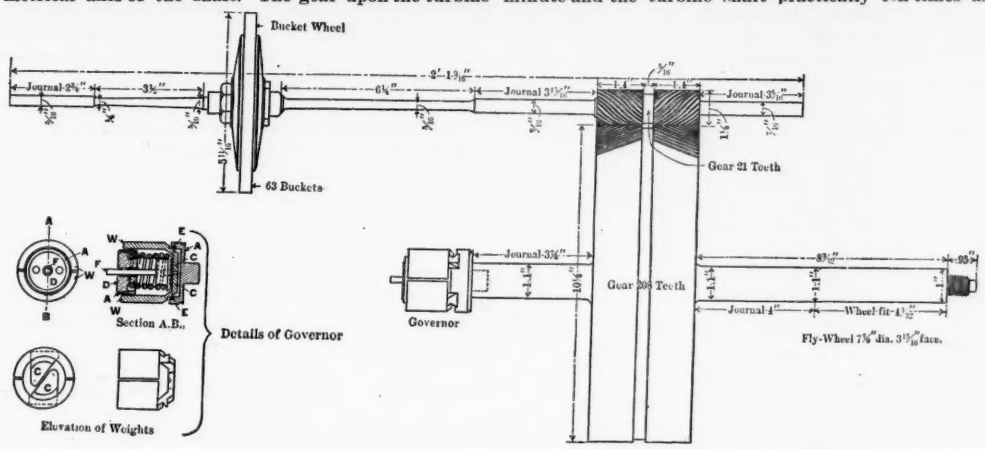


Fig. 2.

shaft is of steel, solid with the shaft; that upon the drive shaft has its teeth formed in a bronze ring, which is carried by a solid iron center. The smaller gear has 21 teeth, the larger one 208 teeth, giving a ratio of 1 to 9.90476.

The shafts run in bronze boxes completely lined with babbit or other soft metal. To assist in the distribution of oil a spiral curve, the pitch of which is about half the diameter of the journal, is cut into the metal of the bearing. The outboard bearing on the turbine shaft is closed at the end, and a small pipe runs from the closed end to a point over the gears. The pumping action, resulting from the presence of the spiral oil way, gives a constant though small, supply of oil upon the gears. The gears do not dip in oil, though the case which encloses them receives drainage from all the bearings.

The governor is connected with the driving shaft, of which, at first sight, it appears to be but an extension. It is shown in detail in Fig. 2. The weights, *W W*, with their arms *C C*, are in the form of a split cylindrical cup. Upon the outside and at the base of each weight a knife edge, *EE*, is formed which bears upon a suitable surface in the governor frame, *AA*. A spiral spring is fitted at its inner end with two projecting pins, which bear upon the arms, *CC*, of the governor weights. The outer end of the spring is connected with the frame by the threaded plug *D*. When the governor is at rest the concave surfaces of the weights are in contact with the frame, and the tension of the spring keeps the knife edges upon their seat. When the governor is revolving at speed the weights are under centrifugal action and move outward, swinging upon their knife edges, against the resistance of the

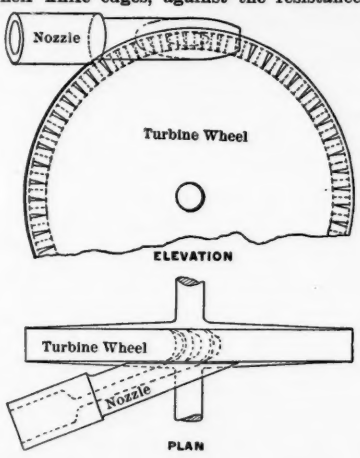


Fig. 1.

spring. The motion of the weights is taken up by the pin *F*, by which it is communicated, through suitable mechanism (not shown), to the governor valve above the engine.

The nozzles which serve to deliver steam to the wheel are four in number, and are so fixed in the frame of the engine as to act upon the turbine wheel at points which are equally distant from each other. Two of the four are provided with stop-cocks, which, when closed, put out of action the nozzles with which they are connected. By means of the stop cocks, therefore, the engine may be run under the action of two, three or four nozzles, at will of the engineer.

The distinguishing feature of the engine, perhaps, is to be found in the form of the nozzles. All are diverging, the throat or smallest diameter being approximately 2 in. from the discharge end. Three have a diameter in the throat of 0.138 in., and one a diameter of 0.157 in.

It is assumed that the form of the nozzles is such that the pressure of the steam as it passes from the orifice will be that of the surrounding medium, and, since the flow is nearly adiabatic, it is clear that if this condition is realized all the energy of pressure is transformed into energy of motion before the steam is allowed to impinge upon the buckets of the turbine wheel. The medium surrounding the nozzles in the machine is practically that of the exhaust, so that the expansion from the pressure of the boiler to that of the exhaust is complete before the steam has contact with any moving part of the machine.

Lateral motion of the driving shaft is limited by contact between the large gear and the bearings on either side. With this shaft fixed, the double spiral of the gears makes lateral motion of the turbine shaft impossible. All forces, therefore, tending to displace the turbine wheel laterally are transferred to the slow-moving shaft, where ample rubbing surfaces can be provided without seriously impairing the efficiency of the machine through frictional losses—a happy solution of an otherwise difficult problem. When it is remembered that the parts shown (Fig. 2) are those of a machine capable of developing 10 H. P., that the driving shaft under normal conditions makes 2,500 revolutions a minute and the turbine shaft practically ten times as many, the opportunity for the display of good design and workmanship may be better appreciated. Viewed as a piece of mechanism, the engine appears to merit high commendation, both as to design and workmanship, but the service which has thus far been obtained from it is not sufficient to show the effect of long-continued use.

The Tests.—The power of the engine was absorbed by a Prony brake, cooled by constant streams of water. The exhaust steam was piped to a Wheeler condenser, open to the atmosphere. The water resulting from condensation was drained into tin buckets, which were changed and weighed at regular intervals.

Gages were used to show the steam pressure both above and below the governor throttle, the former giving the pressure available at the engine, and the latter the pressure under which, in consequence of the action of the governor, the steam was admitted to the nozzles. A manometer was also attached to the exhaust pipe, but as this pipe is large (three inches diameter) and the connection with the condenser close, the observed pressure was never appreciably different from that of the atmosphere.

The boiler pressure for all efficiency tests was 130 pounds by gage, for which pressure the particular nozzles used were designed. The rated speed of the flywheel is 2,400 revolutions per minute (23,771 for turbine wheel), but this standard was not maintained for all the tests. The governor was adjusted several times as the work progressed, and it was not until several tests had been run that the proper speed was secured. It is believed, however, that the differences of speed recorded do not materially affect the value of results for purposes of comparison.

The tests are grouped in three series, the first including those for which all four nozzles were in action, the second with three, and the third with two. The several tests in each series were intended to vary from each other only in amount of power delivered from the wheel. All tests were of thirty minutes' duration, and all observations were taken at five-minute intervals. The conditions of each test were maintained with such uniformity that the observations of any five-minute interval were very nearly identical with the average of all observations taken for the test.

TABLE I.—A SUMMARY OF RESULTS OF TESTS.

Nozzles.	Number of Test.	Revolutions per minute of belt wheel.	Brake H. P.	Steam Pressures by Gage. In boiler.	Steam Pressures by Gage. In engine below governor valve.	Total Lbs. of steam per hour.	Lbs. of steam per H. P. per hour.
All four nozzles in action, three having a diameter in throat of 0.138 in. and one a diameter in throat of 0.157 in.	1	2138	0 00	130	17.1	120 8	.....
	2	2545	1.63	130	42.2	210.3	128.6
	3	2038	2.36	130	48 5	230.8	99 8
	4	2118	2.97	130	55.6	254.6	85 7
	5	1917	3.46	130	61 9	275.5	79.6
	6	2072	4.38	130	70.8	313.0	71.5
	7	2128	5.10	130	76.9	328.5	64.4
	8	2576	7.52	130	99.6	403 0	53.6
	9	2153	8.24	130	104.4	422 8	51 3
	10	2411	10.33	130	126.3	491.8	47.8
Three nozzles in action, two having a diameter in throat of 0.138 in. and one a diameter in throat of 0.157 in.	11	2584	0.00	130	31.3	121.4	....
	1	2112	3.95	130	83 6	267 8	67.8
	13	2125	4.77	130	93.4	286 0	60.0
	14	2490	6.59	130	111.7	346 3	53.3
Two nozzles in action, each having a diameter in throat of 0.138 in.	15	2546	0.00	130	42.2	99.3	.....
	6	2049	1.95	130	83 5	162.6	83.4
	7	1909	3.43	130	121 1	222.9	65.0
	8	2412	3.87	130	127 0	229.6	59.3

It will be seen that, with all four nozzles in action, and with the engine developing a little more than its rated power, the steam consumption per horse-power per hour is as low as 47.8 lbs. In comparing this result with results obtained from other engines, the small size of the engine tested (10 H. P.) should be kept in mind, and also the fact that the rate of consumption stated is based upon brake power. The efficiency of the engine falls off rapidly as the load is decreased, and, as would be expected, the effect is most marked when all the nozzles are in action. This may best be seen by means of the three heavy-lined curves given in Fig. 3. Assuming the nozzles to be cut out of action one at a time, as soon as the reduction of load becomes sufficient to permit the work to be done without them, the minimum steam consumption at different loads, for the boiler pressure and speed employed, is represented by the broken line *fgdebc*, Fig. 3. Again, if, instead of four nozzles, an infinite number could be employed, and if the governor could be arranged so as to regulate the number in action rather than the pressure admitted to them, the steam consumption of the engine in question might be made to follow a line somewhat similar to the light broken line

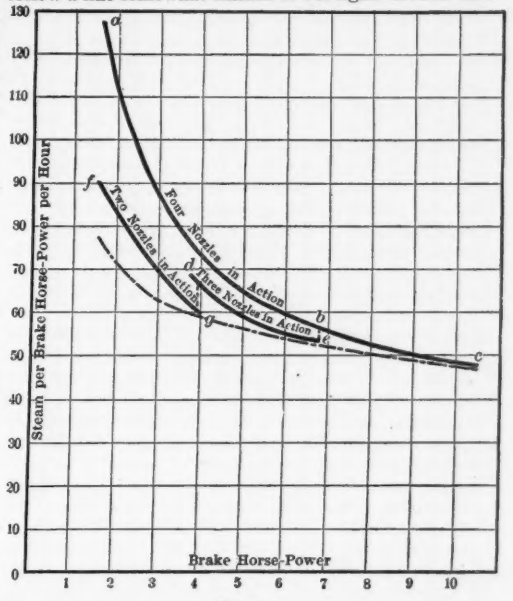


Fig. 3.

gec. But the heavy lines indicate the results which were actually obtained.

The engine requires very little attention and is almost noiseless in action. The governor is quick to act, and its speed regulation appears to be fair, except when changes of load are large and suddenly made. After such a change, the engine requires a little time before settling down to steady running under the new conditions.

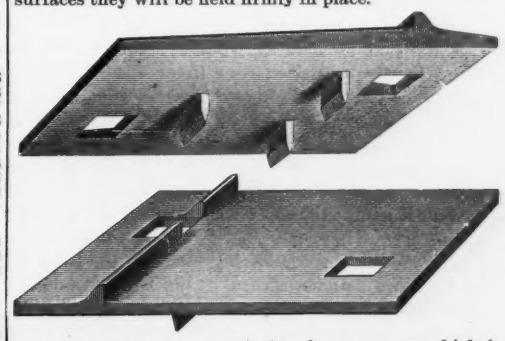
Starting Power.—As the speed of the de Laval engine is high, it is evident that the force in action must be comparatively low. To determine the maximum resistance under which the engine might be expected to start, the brake was clamped upon the flywheel so that the latter could not turn within it. Steam was then admitted to the engine, and readings were taken from the scale under the brake arm. The result of this process, of course, depends upon the steam pressure and the number of nozzles in action. With all nozzles, and with a steam pressure of about 125 lbs. by gage, the maximum starting power is equal to a force of 30 lbs. acting at a radius of 1 ft. The following tabulated data (Table II.) gives the starting-power for different pressures, and when two, three, or four nozzles are in action:

TABLE II.—STARTING POWER OF ENGINE.

	Four nozzles in action.		Three nozzles in action.		Two nozzles in action.	
Steam pressure by guage.	125.2	71.1	125.2	71.1	125.2	71.1
Effective radius of break arm, feet.....	1.5	1.5	1.5	1.5	1.5	1.5
Reading of scale under brake arm, pounds.....	20.0	12.1	14.1	9.0	9.5	6.0
Equivalent force in lbs., acting at a radius of one foot.....	30.0	18.2	21.2	13.5	14.3	9.0

The C. A. C. Tie Plate.

The engravings show the latest form of what is known as the C. A. C. tie plate, made by the Standard Railroad Equipment Co., of New York. The latest modification has been in putting the lugs which engage with the tie directly under the base of the rail, and increasing their lengths and making them sharper. It is believed that now they will enter the tie with the least possible injury to the fiber, and that as they have considerable parallel surfaces they will be held firmly in place.



A bevel plate is now made by the company which is illustrated in one of the engravings. This cants the rail inward one-eighth of an inch, a result which some railroad engineers in this country are beginning to desire, and which, as our readers of course know very well, is usually sought on European railroads. The plates are made in standard sizes of 8¾ × 6 in. and 8¾ × 5 in. and thicknesses of one-quarter and three-eighths.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

It appears that there was a clerical error in the copy of the Joint Traffic Association agreement that was given out to the newspapers after the meeting of Nov. 19. The clause permitting a company to withdraw on 90 days' notice has not been essentially changed since the October meeting, and Section 2 of Article 21 should read:

"This Agreement shall take effect Jan. 1, 1896, and shall continue in existence for five years thereafter. *After said period* any company may retire therefrom upon giving 90 days' written notice of its desire to do so."

It is proper, however, to say, in this connection, that our comment concerning the weakness of the five-year provision was not based chiefly on the erroneous idea that a road could withdraw at any time on three months' notice. The weakness of the provision lies chiefly in the fact that the clause is, for the present, and probably for six months, unnecessary, and practically meaningless. The other alleged weak spots in the agreement will either kill it or prove harmless in a good deal less time than five years. As the agreement now stands the five-year term is not essential to any clause except that which provides for establishing joint agencies and changing other agencies. To make these changes the five-year term is necessary to give stability; but it is not likely that this part of the programme will be undertaken until the other new features shall have been tested for a few months. When the managers and arbitrators have been appointed and have got adjusted to each other, and have tried their powers a few times; and when it shall be seen whether every board of directors understands the import of the promise it has made to have its rate-cutting done at headquarters, officially, instead of on the street, stealthily, then will come up the question of making changes, which will reach into future years. Then the five-year clause will be needed; and, assuming that satisfactory progress shall have been made that far, it is not unlikely that there may be a favorable sentiment strong enough to make the whole agreement more rigid.

A decision of some importance was recently rendered in the United States Circuit Court, Northern District of New York (Judge Coxe), in the case of the Gould Coupler Co. against Pascal C. Pratt and others (Pratt & Letchworth). Up to the time of going to press last week we had not received the text of the decision, and the reports of it were obviously incomplete and misleading; therefore we refrained from any attempt to state its scope. We now have the decision in full. The suit was for infringement of the Browning and Barnes patents (owned by the Gould Company) by Pratt & Letchworth in manufacturing the Pooley coupler. The Browning claim in question was for the means of automatically opening the hook (knuckle) and holding it open, in proper position for coupling. The decision is that the Browning patent is valid in the broad claim not only of the specific means described but of any means for automatically opening the knuckle and retaining t open in the coupling position. The Pooley device is clearly an equivalent for the means described in the Browning patent. Browning used a spring and Pooley used a lever, but it is quite immaterial whether the knuckle was opened by a spring, or a lever, or a spiral incline. The point is that the Browning patent is good for any means which accomplish the results; but it will be observed that these results are *automatically* opening the knuckle and *keeping it open*, and it must be kept open by some other force than inertia or friction. Therefore, the judge says specifically that a device which will automatically open the coupler but does not keep it open may be used without infringing. The Court does not define strictly what would constitute automatic opening. It will be seen, therefore, that the Browning claim is pretty strictly limited. The Court says that it would not have been so limited if Browning had had the assistance of an experienced solicitor; that is, he would probably not have coupled the opening and the retaining features together and made them vital parts of one claim. Thus it becomes impossible for the court to give the patentee the full benefit of his invention. In the matter of the Barnes patent it is held that the Pooley coupler does not infringe. The complainant is entitled to a decree for an injunction and an accounting, based upon the claim of the Browning patent; but as the claim under the Barnes patent is not sustained, the decree does not carry costs. We should suppose that this decision would have one very important result—to spread the idea that there are some coupler patents that are worth something.

Still another car coupler decision is just announced The St. Louis Car Coupler Company brought suit in a United States Circuit Court against the Schickle, Harrison & Howard Iron Company, and the suit has just been decided in favor of the complainant, the decision being written by District Judge Adams. The complainant employed the defendant to make about 1,000 couplers under patents owned by the complainant. The order was filled and then the defendant continued to make and sell knuckles of the same form. The Schickle, Harrison & Howard Company claims that it can lawfully make and sell these knuckles to purchasers of the complete coupler who may need them for repairs. The decision is that the patent is a combination patent, including the drawhead, the knuckle and the locking pin, and that the knuckle is the important feature of the combination. There is no question as to the validity of the patent; the only question is whether or not knuckles made and sold as has been done by the defendant are repairs within the meaning of the rule which entitles the purchaser of a patented article to repair it when worn out. It is held that a purchaser of a patented article may use it until it is worn out and repair and improve it as he pleases, provided the repair and improvement do not amount to a reconstruction. In the present case the court holds that the knuckle is the chief element in the patented combination and that the use of it to supply the place of worn out knuckles amounts to reconstruction and is not repair. The decision then is that the defendant infringes and an order may issue for an injunction and accounting.

We were able to give two or three weeks ago some definite facts as to economy to be got by using air-brakes on freight trains. Unfortunately, such facts are difficult to obtain, and the advantages of air-brakes are necessarily left largely to the imagination. On the other hand, statements like those brought to light in the able paper by Mr. Waitt which we published last week, although wholesome in their result, are calculated to alarm those who do not think the matter all the way through. We give below a report of an incident that happened last month on an Eastern railroad which illustrates admirably some of the advantages of continuous brakes. Indeed the fact that the train in question was completely fitted with air brakes may have saved enough in cost to pay for a good may of the troubles that Mr. Waitt points out as incident to trains only partially fitted. We give the story in the words of a very competent observer, omitting only the names of the railroad and station.

"They had a break-in-two on the —— the other day of which they are very proud. They are running many live stock trains over that road, and have been hampered about making time, which engineers laid to the rules in their time table. This they were going to overcome, so they fitted up their trains with Boyer speed recorder and the Trainmaster rode with the trains to see where they could modify the rules. This first train started from —— with the idea of delivering the train to the—— on time. They had 23 cars in the train. In pitching over a slight grade, before descending a heavy grade, the train parted between the eighth and ninth cars, and the train came to a stop inside of the length of the train and the two sections were 8 ft. apart. When the record of the Boyer device was taken it was proved that the speed was 38 miles an hour. The officials were highly pleased as this was a train in actual service with load and all. The air-brake in this case canceled the cost of all the brakes they have."

This case is valuable as being a typical one, but in fact we do not yet accept Mr. Waitt's theory that more accidents and more serious accidents take place with trains only partially fitted with air-brakes than with trains worked only by hand-brakes. This is a matter that can be settled only by statistics, which, unfortunately, are not at our command, except in the case of the New York Central, an account of whose experience we have already published We are much of the opinion that if sufficient facts were accumulated we should find a great saving in cost of accidents, even where trains are run with only a few of the cars equipped with air-brakes. But there is another confusing element that comes into the question. In considering it we should take into account the fact that freight trains are run faster where air-brakes are used, and this alone would naturally make the accidents more numerous and more serious. Nevertheless, there are many reasons why freight trains should be run faster, or, at any rate, why they will be run faster. In considering Mr. Waitt's paper, one should also remember that that road runs very long freight trains and runs them at pretty high speeds.

The chairman of the Joint (Signal) Committee of the American Railway Association says that many members of the Association would like to substitute the word "stop" for "danger" where it is used in the code of rules to describe the indication of a red flag or light, or a semaphore arm that is in a horizontal position; and there was a bit of discussion on the subject at the October meeting. The committee, however, seems to have felt that the abandonment of the time-honored *danger* would be too rude a shock to the hoary traditions which still cling to a good many time tables, and did not recommend the change. We hope that the members of the committee will abandon this position and make the change. It would only be following the course already pursued in expunging the full-faced type from the rules of the standard Code. The use of the word "danger" is based on the same theory that prints some rules on the time tables in letters an inch high, with the display of a poster. This custom still prevails on some roads. This is in marked contrast to the custom, also still prevalent on the best roads, of writing telegraphic orders (which certainly are the most lively kind of a danger signal) in careless handwriting and with a dim pencil. What could be more inconsistent? The word "stop" is more strictly accurate than "danger." A red signal does not always mean danger. Rule 75 requires it to be used to stop trains to take on passengers. "Safety," for white, is also lacking in precision, as was suggested in the discussion. The member who suggested "proceed" would have hit the mark if he had used the more idiomatic "Go-ahead." The English phrase, "line-clear," is good enough, however, after it is changed into "all-clear" to make it more easily pronounceable. The term "caution" is more difficult to deal with; for the existence of the caution signal, and the theory on which it is used, rest upon a less logical basis. When the signal is used at a home signal for permissive blocking the term "caution" is well enough. Of course, we cannot add the "ly" to "Go slow," as the standard code would require; the caboose literary committee would revolt.

Another bad wreck which, like that at Rome on Nov. 19, was caused by malicious interference with the track, happened on the night of Dec. 1, not a great many miles from the scene of the former disaster. It was at Preble, N. Y., on the Delaware, Lackawanna & Western, about 26 miles south of Syracuse. The regular night express for New York, traveling 50 miles an hour, ran over a misplaced facing-point switch and into some freight cars standing on the side track, wrecking the engine and three of the freight cars. The engineman was crushed beneath the engine and his body was partly consumed by fire. The fireman was rescued after an hour, but very soon died. The switch lock had been broken, and the switch rails had been wedged midway between the two stock rails, so as to surely derail the engine. All of the cars of the passenger train but one were derailed, but the passenger cars were not overturned and no passengers were seriously injured. The wreck took fire and the woodwork of the engine and four cars was completely consumed. This disaster furnishes a vivid illustration of the need of a distant signal for every facing point switch. It is true that there are various other ways in which a person with diabolical intent can wreck trains, and it is imaginable that a person fiendish enough to commit murder by wholesale might still be intelligent enough to fasten a signal lamp in the safety position before misplacing a switch rail; but it remains true that an efficient signal would thwart a considerable percentage

of the attempts to derail passenger trains. A distant signal costs only about $50 or $75, and in view of its cheapness and simplicity the lack of it at thousands of switches is the most obvious deficiency in roadway appliances now existing in this country. To run passenger trains at fifty miles an hour in the middle of the night, with such death traps as that at Preble scattered along the road, is simply tempting fate—to use no harsher term. If the fire which burned up the wreck (and a storehouse near by) was started by lamps, as stated in the reports, and not by the coals in the firebox, the lesson concerning the danger of using oil lamps in passenger trains is also as plain as day. People who argue against gas and electric lights emphasize the fact that the losses of life and property in oil-lamp disasters have been but a very small percentage of the total of lives and property that have been risked; but they should remember that the smallness of this percentage has been in a great measure due to the moderate speeds at which night trains have been run for the past 40 years. It is one of the blessings of civilization that the locomotive can carry us a long distance in a short time, but engines to travel 60 miles an hour are just as available to roads which do not have all the best safety appliances as to those which do; and slow roads do run fast trains.

Squire Western on Fast Runs.

Two or three years ago a number of English railroad officers expressed their doubts concerning some reported fast railroad run that had been made in the United States. They were assured that there could be no mistake as the time between mile posts had been carefully taken by three different observers, men of skill and character. One of them replied, "Ah, but the mile posts may have been too near together." There was nothing to indicate that this was said in joke, but the aids to humor which abound in the pages of *Punch* are difficult to introduce in conversation.

Two or three months ago, when a group of fine young Englishmen came over here from the London Athletic Club to compete with the New York Athletic Club in certain track and field games, some of them at least were very sceptical as to the authenticity of all American sporting records, and they were quite prepared to find an American hundred-yards at least a second shorter than an English hundred-yards. Those young men were beaten, as the world knows, in eleven straight events. Several of them beat their own best records and a number of world's records were broken, and, being manly and intelligent young sportsmen, that group of Englishmen went home with their ideas cleared up as to times and distances in America. They acknowledged that they were fairly beaten on the merits of the case.

Likewise, there appears to be little doubt that English railroad men and English engineers, who certainly are not lacking in intelligence, now accept generally the published times and distances of recent fast runs made in this country, when those times and distances are published by respectable authority. It is probably true that most educated Englishmen admit that we can measure a mile, can read a watch, can build a locomotive and can tell the truth. There is, however, a class of Englishmen, the direct lineal descendants of Squire Western and his kind, who cannot see that they are fairly beaten until their heads are broken. It is a favorite notion with those brave but benighted individuals that all Yankees are bragging liars, quite capable of setting mile posts 4,000 feet apart; and, doubtless, some of them really believe that San Francisco is not much more than 2,000 miles from New York. It is true that the branch of the British race which inhabits the United States can furnish a good many examples of the same sort of men. The blood of Squire Western flows still on this side of the water also.

The Squire sometimes appears in London as a writer for the engineering papers. The latest of his efforts which we have discovered appears in *The Engineer* of Nov. 15. He has learned to spell, and he can sign his name without turning up his sleeves and putting out his tongue, but his capacity for logical thought does not seem to have improved much. This time he undertakes to discuss the recent fast run made on the Lake Shore & Michigan Southern. He confesses "that he has always looked with doubt on the high speed statements which have come to us from the other side of the Atlantic." In the case which he is now considering, however, "either the figures have been deliberately falsified, or a stupid blunder has been made, or a train has actually run for a great many miles at a speed of nearly 73 miles an hour." He admits that this beats all previous records, and then goes on to consider its possibility.

He discovers that the supposed run of 86 miles at a speed of 72.91 miles an hour was made by a very ordinary locomotive, namely, a six-coupled engine (or, as we should say, a 10-wheeler) having drivers 5 ft. 8 in. in diameter, cylinders 17 × 24 in., hauling a train weighing altogether about 225 tons (502,500 lbs., including engine and tender). He proceeds to ascertain the power which it is possible to develop in such an engine as was used and to show what the resistance must have been and thinks that he will not be "considered rudely incredulous if he asks for further explanation." Bless his old heart, no; he may be rude, but he has never been incredulous. But we will quote some of the Squire's words. It will be observed that in 150 years his style of debate has lost something in force and gained much in refinement; but his humor is eternal.

"We do not think it possible that the average effective cylinder pressure could have exceeded 50 lbs. on the square inch. . . . This pressure represents, then, say, 1,500 H. P. indicated, as the maximum power of the engine. . . . We may here ask if it was possible that 1,500 H. P. could be got out of a boiler with 1,700 sq. ft. of heating surface. We answer emphatically, no, it could not, at least for any considerable period. . . . The effective pressure, therefore, must have been much less than 50 lbs, probably nearer one-half of it. Judging by the records of very similar engines which have made long runs we think we shall not be far off the mark if we assume that the engine developed 700 H. P., which would have been a very fine performance even with so large a boiler. Let us see what was done with the power. . . . The available tractive effort, then, was . . . a little over 15 lbs. per ton. Can we bring ourselves to believe that a train, composed of very bulky cars, can have been run at 73 miles an hour with a tractive effort of about 15 lbs.? Nothing over is left for engine friction and the engine was six coupled. But experiments made with much care in the States have shown that not more than about one-half of the horse power of a locomotive is available for hauling the train."

After some discussion of a few of the available experiments on train resistance, the Squire remarks, with his fine gift of irony:

"It is not for us to say that official figures lie; but it is open to us to say that if the speed said to have been attained on the line on the day named was really attained, then it is certain that there is some peculiarity about American track and American rolling stock that is not found elsewhere in the world; and we advise all railway men in the country to hasten to ascertain what it is Ostensibly the performance was almost impossible on a level, or compensating track."

If the Squire had been a faithful and credulous reader of the *Railroad Gazette*, this example of low train resistance at high speed would not appear so impossible, nor would he be so surprised and concerned. It has been shown in these columns that the entire train resistance taken from the power of the cylinders, and *pro rated* over the whole train, without making allowance for the internal friction of the engine, has been in some cases only about 12 lbs. per ton at about 90 miles an hour We fear that the Squire has set up a straw man only to knock him out in good old Marquis of Queensbury style, as will appear from an analysis of the argument.

Commencing with the assumed mean effective pressure of 50 lbs., it is important to find that the *Railroad Gazette* has shown that there are engines in this country which give more than 60 lbs. mean effective pressure at 70 miles an hour. Finding that the 1,500 H. P. arising from the 50 lbs. mean effective pressure, rightly appears to be too much for the boiler, Squire Western arbitrarily reduces it to 700 H. P., and takes this arbitrary assumption as a fair basis for further reasoning. And then he finds that there is no margin of power to overcome the internal friction of the engine. The internal friction of a locomotive, aside from the friction of the main journals, is not over 6 per cent. If the internal friction is taken as 10 per cent. it would only amount to 70 H. P. on this basis, and would make the total horse power 770. After having reduced the horse power arbitrarily from 1,500 to 700 it is unnecessary to split hairs about a matter of 70 H. P. The difference in the condition of the digestive organs of the fireman on different days would affect the boiler more than this.

Of all the fallacies that have ever been published about locomotive performance "in the States," one of the most unwarranted is the statement which the Squire has remembered, that "not more than about one-half the horse power of a locomotive is available for hauling the train." The statement was made by an irresponsible publication, and we are surprised that anyone should have taken it seriously. It carries the presumption that the engine in itself, without regard to its weight, absorbs one-half of the power which it generates. This is a simple case of distorted facts. The facts are that a locomotive running about 70 miles an hour, hauling a light train, gave a pull behind the tender, on a dynamometer car, equal to only about 30 per cent. of the pull which could be calculated from the cylinder power taken from the indicator cards. It was a fact that not only 50 per cent., but even 70 per cent., of the power generated in the cylinders was absorbed by the engine and tender. But, and here comes an important fact, the weight of the engine and tender was more than 60 per cent. of the total train weight; hence, at least 60 per cent. of all the power generated belongs to the engine and tender. This leaves 10 per cent. for the internal friction and the head air-resistance. These facts are well known here, and readers of the *Railroad Gazette* have long known the errors of the statement which has misled the Squire. We doubt, indeed, if intelligent railroad men here or abroad ever believed the statement.

The Lake Shore run does not appear impossible to those who have kept pace with recent experiments; but to show that it was possible is a simple matter. The train resistance, taken from the indicator cards, in good weather, on a practically level, straight track, of which the Lake Shore is an excellent example, would not exceed 15 lbs. per ton. Taking the weight as 225 tons, the resistance would be about 3,400 lbs.; call it 4,000, and we shall reach the results frequently found on the Pennsylvania road under more severe conditions. The speed of 73 miles an hour is 6,424 ft. per minute. This gives 780 H. P., which is well within the limits of the engine and boiler.

The Union Pacific and Western Union Case.

The determination of the controversy between the Government and the Western Union Telegraph Company by the United States Supreme Court, which was briefly reported in the *Railroad Gazette* Nov. 22, contributes nothing new or startling to legal literat ur in the estimation of those who have followed the case since Justice Brewer, of the Supreme Court, sitting i the Eighth Circuit, first disposed of it. The lines upon which the litigation was to proceed were first marked out by him, and whatever of novelty in judicial decision the case was capable of was shown in his opinion. From that time on the controversy gathered interest, because there was much in Justice Brewer's opinion, that, if finally upheld, would have a widespread influence in clearing up some interesting questions as to telegraph monopolies.

It will be recalled that the suit was brought by the Attorney-General of the United States under the Anderson Act of 1888, which provides that all railroad and telegraph companies which had received any subsidy from the United States and were required to construct and operate telegraph lines, should forthwith, by themselves alone, maintain and operate telegraph lines for railroad and all other purposes. The suit was to annul the exclusive contract between the Union Pacific and the Western Union, and to compel the road to operate its own telegraph lines. Justice Brewer decreed not only the annulment of the whole contract, but also directed the Union Pacific to maintain and operate its own telegraph, and to exchange business with connecting lines without discrimination. On appeal to the Circuit Court of Appeals, Judges Caldwell and Thayer sustained this decree so far as to annul such features of the contract as gave exclusive privileges to the Western Union in violation of the act of 1888, but reversed it in all other respects. Now the court of last resort says that Justice Brewer was entirely right, and the relief awarded by his decree is at last confirmed beyond any further doubt.

The Court appears to have given much attention to the question whether the Anderson Act of 1888 was constitutional in its application to the Union Pacific; for the Acts of 1862 and 1864, granting aid to Pacific Railroads, were alleged to constitute a contract with them, when once accepted and acted upon by them, and as Congress could not pass any law impairing the obligation of contracts, the Anderson Act was not within the power of Congress. But the Court held that Congress had reserved the power to add to, alter, or amend the Acts of 1862 and 1864 so as the more thoroughly to accomplish the very purpose of those Acts. "Legislation enacted under such a power must only be within the general scope and consistent with the objects of the statute added to, altered or amended, but it must respect transactions fully consummated and rights actually vested before any such additions, alterations or amendments are made."

The most interesting point decided, however, relates to the contract which the Western Union held, giving it the exclusive right to establish and maintain the telegraph business over the right of way of the Union Pacific. The question here presents itself in a double aspect. Was this exclusive right valid, as a question of general or common law? If so, was it nevertheless forbidden by any express statute of the United States? Conceding that such a privilege was not obnoxious to any principles of the general law, it, of course, might still be null and void from the operation of explicit legislative enactment.

The Supreme Court considered the question in both aspects and holds that the grant of exclusive privileges to the Western Union was not only void as against public policy, but was especially in contraven-

tion of the statutes of 1862 and 1866, as well as of the Anderson Act of 1888.

So far as we are aw are this is the first time the Supreme Court has passed directly upon this important question in the form now presented. The effect upon the busi ess of the Western Union, which holds a large number of these exclusive contracts, may be far-reaching. Certainly the decision opens up new possibilities to competing companies anxious for equal privileges that could not have been hoped for before.

In 1877 the court decided somewhat similarly in a case to which the Western Union was a party seeking the benefit of the principle which is now directed with such telling force against itself. Then the Pensacola Telegraph Company had a charter from the state of Florida granting it certain exclusive privileges. The Pensacola & Louisville Railroad Company granted to the Western Union the right to erect a telegraph line upon its right of way, which ran through the territory over which the Pensacola Telegraph Company had the exclusive privilege by charter. When the Western Union began the erection of its line, the Pensacola company sought an injunction. Prior to this time it was a mooted question whether intercouse by telegraphic messages was commerce within the meaning of the constitutional provision which bestowed the regulation of commerce be ween the states upon Congress alone. In an opinion of unusual cogency and clearness, Chief-Justice Waite held that the powers thus granted are not confined to the instrumentalities of commerce known or in use when the Constitution was adopted, but they keep pace with the progress of the country, and adapt themselves to the new developments of time and circumstances.

He pointed out that by the Pensacola charter, Florida had attempted to regulate this species of commercial intercourse between its citizens and those of other states. This was encroaching upon the constitutional prerogatives of Congress, and was held to be null and void. Attention was also called to the Act of Congress of 1866 which Justice Waite declared amounted, in effect, to a prohibition of all state telegraph monopolies. Justice Harlan did not sit in this great case. Justices Field and Hunt dissented. But the authority of the decision has never been questioned; on the contrary it has been always, and often, cited with approval, and has blazed the way for all the best considered cases on the subject from that day to this.*

It would, perhaps, go too far to say that a railroad company cannot for any purpose or under any circumstances grant an exclusive privilege; but it may be now considered settled that no road doing an interstate business or making an interstate connection can grant efficaciously an exclusive telegraph privilege. Such grant may be good so far as to protect a company in attending to its business, but it is inoperative to prevent the business of other lines over the same roadway. If a railroad existed entirely within the bounds of one state, without interstate communication, exclusive telegraph privileges might be granted, if authorized by the law of that state. If under such circumstances the railroad company owned in fee simple without restriction or condition, its entire roadbed, we apprehend it could grant such privileges, subject to supervision, over rates notwithstanding there were no express statute allowing those grants, simply because they are the incidents of absolute ownership of land, always to be enjoyed unless positively forbidden. Such exceptional circumstances do not, to our knowledge, exist and are not likely to exist. So that for all practical purposes exclusive telegraph privileges must hereafter be considered monopolies and void to the extent of their exclusiveness.

Practically, the effect of this decision on the fortunes of the railroads and telegraph companies will be affected by a variety of conditions. Probably from 90 to 99 per cent. of the railroads of the country are traversed by Western Union lines. On the great majority of lines there is no demand for more than one line of telegraph, and although the way business often is worth having, there are probably few lines where a rival company would fight very hard for a chance to compete for it. Telegraph profits come from the large cities, and to get the best and shortest route between these is the chief aim of all telegraph companies. Any railroad ought to be able to do its own telegraphing as cheaply as any telegraph company could do it, but the privilege of sending messages all over the country, both on the company's business and on the officers' private affairs, which goes with all railroad contracts, is a material advantage, and the customs that have grown up in this connection will tend to give railroad men a predilection in favor of the Western Union. At the same time, the carrying of material and linemen for an additional company may in some cases be an element of some consequence, and any road whose contract with the Western Union is not thoroughly equitable will probably find opportunities of doing better without going far to seek them.

The only large telegraph company besides the Western Union is the Postal, which reported in its last annual report less than 20,000 miles of line, pole and cable together. Probably a very large proportion of these lines are on highways. As the distance from city to city by highway is generally from 10 to 30 per cent. greater than by railroad, and as the expense of inspection is very much higher by wagon than by cars, it will not be surprising if some of the railroads receive overtures from this company. The Wall street gossips say that the Bell Telephone Company, when its contract with the Western Union expires next year, is likely to go into the telegraph business.

*The Supreme Court next considered the telegraph as a species of commerce, in a case where the State of Texas imposed a tax upon every message sent by the Western Union. This tax was held to be unconstitutional, in respect to those messages that were to be delivered without the state of Texas as a regulation of interstate commerce. This aspect of the question brought up in litigation over taxes and licenses, has often been considered since and always with the same result.

In 1880 an interesting phase of the question, considered purely as one of principle aside from the authority of a statute, appeared in a case in Georgia. The Western Union had exclusive telegraph privileges with a number of railroads in that state. The American Union Telegraph Company was proceeding to erect its lines upon these railroads when an injunction was sought by the Western Union. The single question then before the Court was whether the contracts granting the exclusive right were valid or void. The Supreme Court of Georgia held that they were made to cripple and prevent competition, and enabled the Western Union to fix its rate at a maximum governed alone by the necessities of its patrons; that they were not favored by the law and were against public policy, because they tended to create monopolies and were in general restraint of trade.

The same view was entertained by Judge Hanford, sitting in the United States Circuit Court in the State of Washington in 1892. The Pacific Postal Telegraph Cable Company sought to enjoin the Western Union from constructing and operating a telegraph line on the right of way of the Seattle, Lake Shore & Eastern, on the ground that the Postal Company had an exclusive right of telegraph privilege from the railroad company. The Court held that the privilege was void on the ground that the railroad company had not the power to make any such grant, because it was an attempt to create a monopoly in the use of its property.

A Little Accident and an Editor.

One morning last month the down trains on one of the lines of the Manhattan elevated in New York were delayed by a slight accident to a locomotive. This is how one of the leading newspapers of the metropolis treats the matter:

> The conditions of that incident were such as ought to be impossible on any decently regulated road. They were favorable for a wholesale slaughter of passengers, and that such a catastrophe did not occur is to be credited not to the managers of the road, but to the inscrutable Providence which cares for children and fools. . . . An engine broke down. . . . The trains behind it were not stopped at stations and held there until the line was cleared. They were run on, the front of one close up to the rear of the one ahead, and then stopped between stations, wherever they chanced to be. The passengers . . . set about leaving the trains and making their way downtown afoot, or on the surface cars. Had the trains been held at stations they could have done so easily and safely. As it was, they had to walk along the tracks, block after block to the stations. This scores, perhaps hundreds, of them did. While the tracks were thus thronged with pedestrians the trains began to move. Up trains came dashing along on their track. The long procession on the down track got under way. And on the center track the express trains thundered along at high speed. The passengers clung, as best they could, to the narrow path between the tracks, and watched their chances to dodge between trains and reach the platforms. . . . That dozens were not ground to mincemeat under the wheels or dashed to the street below was wellnigh miraculous. . . . The elevated railroad company, and the city of New York, have nothing but luck, or Providence, to thank that yesterday morning was not marked with an almost unexampled horror.

One expects more or less intemperance of language from women and children, mainly because they have not been disciplined by circumstances. But in a grown-up man we have a right to expect that he will take pains to find out the facts before he talks, and then to speak with some regard for the facts and with decent moderation of language. Unfortunately these obligations of civilized society are sometimes forgotten by the editor when he thinks that mere abuse will be popular. The words quoted are a fine example of editorial irresponsibility.

The facts are that at 7:20 a. m., a time of very dense traffic, and when trains are running on this part of the Manhattan road at intervals of about 45 seconds, a crank pin broke at or near the Ninety-third street station on the southbound track. The rods were bent badly and had to be disconnected before the engine could be moved. The delay in taking down the rods was 20 minutes. Meanwhile, the southbound trains were turned at 104th street to the middle track, on which they ran down to Eighty-first street, thus running around the disabled trains. In this way the stream of downtown trains was kept moving. Necessarily, however, they could not be moved at their regular speed, for at that place and at that time of day the middle track is already occupied by a number of express trains.

Twenty minutes was surely a short time in which to take down the rods and get the engine ready to move, and the time could only have been made so short by good management and by skill on the part of the men. In fact skillful workmen are distributed at various points along the lines and supplied with tools for emergencies. Moreover, great care is taken to get good material and good workmanship in the engines, cars and tracks of the Manhattan. That this is so sufficiently proved by the record of the working of that system, a record which has the admiration of all competent and well-informed observers. The pin which broke was of Midvale "special" steel and had been in service about two years and had made 95,990 miles.

The easy remedy suggested by the editorial writer for the undoubted inconvenience of stopping the trains between stations—namely, to hold the trains at the stations above the obstruction, would be quite impracticable. Above Ninety-third street there are five stations before the 155th street terminal is reached. Obviously, if the trains had been held at the station platforms, only five trains could have been on the line, distributed over more than three miles, and it is easy to see that the delay in catching up to the schedule would have been a good deal longer than it actually was. Moreover, those unfortunate passengers who were traveling to and from intermediate stations would have been unnecessarily delayed. In fact, the only possible way in which the immense train movement of the Manhattan system can be kept up is to allow the trains to follow each other as closely as possible, and it must often happen that there are two trains in the space between two consecutive stations. This shows how difficult it would be to work the traffic under a block system, and how inevitable delays must be in case of fog or breakdown.

The directors of the Lehigh Valley Railroad have lately voted to establish a pension fund for the support or relief of old employees, and to set apart for this fund such portion as may be necessary of the revenue derived from the sale of employees' tickets. These tickets are sold at half a cent a mile, and, if we recollect rightly, the arrangement was adopted two or three years ago, after a vote of the employees which showed that they preferred these tickets to the pass arrangement previously existing. Whether the receipts of the company from this source amount to much we do not know, but the main idea seems to be a good one. As long as railroads pay reasonable wages, any additional expenditure for the benefit of the employees is in the nature of a free gift, and the amount of that gift must be decided by a variety of considerations. Such a gift is generally made mainly for the purpose of promoting good feeling between the directors and the employees, and, with railroad profits as low as they are nowadays, it cannot be expected to be very large. If it is large enough so that the individual employee can see it with the naked eye he should be thankful. The Pennsylvania pays out through the Relief Department about $2.70 a year per member (not per employee; not all employees belong to the Relief Department) and nearly $1 per member additional in gratuities, beyond the sums called for by the contract. The wife and children of the "average employee" on the Lehigh Valley ought to travel three and a half dollars' worth a year without feeling the expense very much. (We assume that the employee himself gets most of his rides free). Thus the employees will themselves contribute to the support of a pension fund without incurring a burden. It is true that the company earns the money and has a right to keep it; but it earns it easily, and the regulation requiring employees to pay fare is commendable, because it tends to promote good discipline and softens the feeling, often prevalent among employees, that some other fellow is getting more than a fair share of the favors; and if a company can by some such arrangement as this induce all employees to cheerfully acquiesce in a fare-paying regulation, it is probably promoting its own interests.

The names of the new Board of Directors of the Atchison, Topeka & Santa Fe are noted in another column. It will be seen that it is a very strong Board, representing a good deal of active railroad experience, but with financial interests naturally predominating. Of the directors named Mr. Hayes is President of the St. Paul & Duluth; Mr. Fowler is President of the New York, Ontario & Western; Mr. Duval is President of the Florida Central & Peninsular; Mr. Haven is Secretary and Treasurer of the St. Paul & Duluth; Mr. Cheney is one of the largest security holders in the company and a son of Mr. B. P. Cheney, who was one of the most influential directors of the old Atchison Company until his death a year or so ago. Mr. Rotch is Treasurer of the Cleveland, Canton & Southern, and represents important financial interests in railroad and other corporations. Mr. Nickerson also represents financial interests, as does Mr. E. J. Berwind, who is President of the Berwind-White Coal Mining Co., of Pennsylvania. Mr. Gibbs is the Treasurer of the New York Life Insurance Co., which has very heavy holdings in Atchison securities. Mr. Morawetz is a lawyer of New York whose firm has been the legal representatives of the Atchison Committee and of many other corporations. There are three Kansas directors, Messrs. Gleed, Holliday and Osborn, the latter an ex-Governor of Kansas.

The order recently issued by the Grand Trunk, and heretofore noted in these columns, directing the adoption of the block system on all of the lines of the company, is intended for the protection of passenger trains only. Station agents (or operators) at telegraph stations are to maintain a space interval *behind* every passenger train or train carrying passengers; the only provision for a space interval *ahead* of passenger trains is that inferior

trains leaving A ahead of a passenger train must reach B before it is time for the passenger train to leave A. Whether, in case of delay to the preceding train, the passenger train is to be held at A, does not appear from the wording of the rule. Probably such cases are managed directly by the train dispatcher. The first clause of the new space-interval rule requires that the foremost train shall have been reported "by regular telegraph message, signed by the agent or operator." Except at terminals, junctions, etc., the agent at B must not send a clearing message to A until the foremost train has arrived at *and departed from* B. The provisions for working when the wires fail require passenger trains to be kept 20 minutes apart, and other trains 30 minutes behind passenger trains.

The City Council of Chicago has passed an ordinance requiring street cars to stop just before instead of just after crossing transverse streets. Experience in this matter seems to produce different results in different places. We do not know that any city has before gone so far as to actually prescribe a rule by ordinance, but the street railroad companies have tried the scheme in various places for a year or two past. In Philadelphia the old practice has been practically restored, throughout the city, we believe. In Brooklyn the newspaper reporters find people who are beginning to worry about the troubles that will be encountered when snow comes; the rear end of a long car will be some distance from the cross-walk, and passengers will have to walk through the snow to get to and from the platform. Some companies object to the use of front platforms by passengers. We should think, however, that if the people of Brooklyn have become reconciled to walking through the mud and filth of rainstorms in spring and fall, they could get along with what little snow falls in Brooklyn in the winter. There would be trouble in Chicago if anywhere, as trains of three or four cars are run on all of the principal lines; but all but one of the cars in a train are remote from the crosswalk, whichever side of the cross-street the stop is made, and this condition has existed in Chicago for years.

The westbound Empire State express now runs from New York to Buffalo in 8¼ hours, which is at the rate of 53.33 miles an hour, including stops. The schedule was changed on Monday last, and the train is now due in Buffalo at 4:45 p. m. On the first day there was a delay of 25 minutes at Churchville, the water-scoop catching on some obstruction, but the running time was made without difficulty, although there was an extra car, weighing 53 tons, loaded with Mr. Daniels and other railroad and newspaper men, and in spite of a rainstorm between New York and Albany and a snowstorm west of Rochester. The eastbound Empire State express has also been accelerated a little. It now leaves Buffalo at 1 p. m., the same as before, and reaches New York at 10 p. m. The rate through is 48.89 miles an hour. This train always has been run over the Hudson Division at a more moderate speed than west of Albany. The New York Central people tell the reporters that this 25-minute reduction of the westbound schedule has been made to keep ahead of the English fast trains. They have learned that the East Coast route to Scotland is running a train from London to Edinburgh, 393¼ miles, at 52.46 miles an hour, and they concluded that it was their duty to beat that rate.

The Board of Managers of the Joint Traffic Association is likely to be ready to organize early next week. Authoritative notices of appointments have not yet been given out by all the roads, but the probable composition of the Board is as follows (names designated by a star (*) we give on the authority of an officer of the road who knows): Grand Trunk, G. B. Reeve; New York Central, H. J. Hayden*; Lackawanna, B. A. Hegeman*; Erie, G. G. Cochran*; Lehigh Valley, J. B. Garrett*; Pennsylvania, D. S. Gray; Baltimore & Ohio, Orland Smith*; Chesapeake & Ohio, O. G. Murray*; Wabash, Milton Knight*.

NEW PUBLICATIONS.

Catalogue of the Hopkins Railway Library. By Frederick J. Taggart, B. A., Assistant Librarian. With an introduction by Edwin H. Woodruff, Librarian. Published by the Library of Leland Stanford Junior University, Palo Alto, Cal., 1895. Square octavo, 232 pages. Price, $1.50 bound, $1.25 unbound.

Mr. Timothy Hopkins, of San Francisco, while Treasurer of the Southern Pacific Company, collected a considerable railroad library, and, in 1892, he presented this collection to the Stanford University. It then numbered 2,000 books and pamphlets. At the same time Mr. Hopkins made provision for the maintenance and increase of the collection. Purchases were made as opportunity offered, and in 1894 circulars were sent to railroad officers and to dealers in second-hand books, with the result that very considerable accessions to the collection have been made in the last year. The catalogue now published covers 9,245 books and pamphlets. The collection is intended to embrace all subjects touching on railroad interests, in order to make the library useful to the practical railroad officer and to the student investigating economic problems.

This catalogue covers what is undoubtedly a valuable collection of railroad literature, but a collection evidently still far from complete. In 1888 the catalogue of the railroad library in the Prussian Department of Public Works contained about 5,000 titles, of which 1,500 were in the department of railroads. This number, however, gives a very inadequate idea of the size of that collection because of the numerous cases in which many volumes, files of journals, etc., are included under one title. The Hopkins catalogue in its 9,245 titles includes a large number of pamphlets. What the proportion of these is we have made no effort to ascertain, but of course they are a very important, in fact indispensable, part of the literature of railroading, and however small they may be physically they must have a place in any complete catalogue.

The Hopkins catalogue is classified, the divisions being bibliography, periodicals and transactions, dictionaries, fiction and verse, general history, biography; then the geographical classification under different countries; then the division of economics, followed by law, construction, equipment, operation and, finally, local railroads. In the geographical classification each grand division is subdivided by nations or other large divisions, and in the cases of the United States and of Great Britian there is a little further subdivision into commission reports, guides, individual railroads and maps. Under the general division of economics there are eight subdivisions, such as finance, the railways and the state, rates, etc. Under equipment and under operation there are also in each case eight subdivisions and under local railways there are five.

Each title is followed by a descriptive note giving some notion of the character of the publication. As, for instance, under the title New York & Hartford is the description "Report of the Executive Committee upon the statistics of business and of the engineer upon the several routes for the contemplated N. Y. & H. R. R., via Danbury. Hartford, 1845. Octavo, pp. 119; one folding map, one folding plate."

Finally there is an index of personal names containing, as we estimate, about 2,500 names. This index contains not only the names that are printed in the main titles, but all that appear in the notes. For instance, under Jervis, J. B., we find a book of 350 pages, being a treatise on the construction and management of railways, etc., published in Philadelphia 1866. We find also in the index a reference which directs us to a report by Mr. Jervis as Chief Engineer of the Michigan Southern & Northern Indiana Railroad, and another reference to a report on a railroad bridge over the Mississippi River at Rock Island. These two or three examples will give some idea of the plan of arrangement and of the scope of the catalogue, a most valuable addition to the literature of railroads, and one which we have no doubt will be enlarged from time to time as the library grows and prospers.

We have supposed that this library, with the resources at its command, contained practically all railroad literature of any value, and the substantial volume issued as a catalogue certainly shows a very valuable collection. But the library appears to lack a number of important volumes and proceedings of railroad associations, which at once come to mind as we turn over the pages. Only one number of the American Railway Association reports is indexed, and that is found under "Railway Association of America." Two volumes of the proceedings of the Central Railway Club are indexed, but none of the Western, New York or New England Railroad Clubs. Nor are there any reports of the Master Car Builders' or Master Mechanics' Associations, or of the Superintendents' or Roadmasters' Associations though the library has the last two reports of the New England Roadmasters' Association. As the publications of these and other technical societies contain some of the most valuable contemporary discussions on railroad subjects, the library authorities will probably see the desirability of having such of these reports as may be obtainable. Under Dictionaries we fail to find the Car Builders' Dictionary or the exhaustive German railroad work, the Encyklopädie des gesamten Eisenbahnwesens. Under Cars we find the Car Builders' Dictionary indexed under Forney, as the editor. But the editions of 1884 and 1895 seem not to be in the library. The *Financial Chronicle* and *Bradstreets* with their valuable railroad statistics, are not on the library shelves.

The library has a great number of law books but does not seem to own any Law Reporters, which in recent years contain, in Supreme Court decisions, most valuable railroad history. The librarian would do a good work if he collated the titles of the leading Supreme Court decisions on railroad cases, and published them under a separate heading in the catalogue.

A good deal of curious information can be obtained by turning over the catalogue pages. The titles relating to Pacific railroads take up more than 10 pages of the volume. Over seven columns are required to enumerate the titles of volumes where the checkered history of the Erie road can be investigated. We miss the interesting "Chapters of Erie" of Mr. Adams, which though now better known as a book title than as the well read volume it once was, contains a record of an episode in railroad history which ought to be in such a library as this one. The astute Mr. Daniels, of the New York Central, seems to have found his way into the library, as more than half a page is devoted to the titles of his summer books.

A Sketch Portfolio of Railroad Stations and Kindred Structures. Fifth Edition. By Bradford L. Gilbert. New York: *The Railroad Gazette*, 1895.

Mr. Gilbert says in his preface that no attempt has been made to provide in this volume a text book, but merely to indicate what has been accomplished in railroad architecture and to encourage further progress in this direction. Consequently little reading matter, beyond the name, size and construction of the buildings, is given The book contains nearly 200 handsome engravings, many of which are reproductions, on a reduced scale, of the drawings which the author exhibited at the Columbian Exposition, and for which he received a medal and first premium; while the rest are reproduced from photographs, designs by the author and drawings by numerous artists.

Mr. Gilbert is architect for over 20 of the leading railroads throughout the country, and Supervising Architect of the Exposition now being held at Atlanta. A few of the stations which have been erected recently from the author's plans, and which are shown in the Portfolio, are: The New York Central station at Syracuse, a handsome structure, 170 ft. × 124 ft., of pink granite with brownstone trimmings and "Spanish" tile roof; it has a rotunda 90 ft. × 90 ft. and 60 ft. in height; the terminal passenger station and railroad offices of the Mexican National, at Colonia, Mexico. 65 ft. × 175 ft., built of tepetate and Mexican brick, cemented over in stucco; the station for the Old Colony, at Fall River, Mass., which is one of those long, low designs with which Mr. Gilbert has been so successful; it is 40 ft. × 185 ft.; the station at Lowell, Mass., for the Boston & Maine, 70 ft. × 186 ft., built of New Hampshire granite, with red sandstone trimmings, and the station at Middletown, N. Y., for the New York, Ontario & Western, 40 ft. × 174 ft., built of brick and stone. Mr. Gilbert shows also a number of designs for proposed stations and office buildings. Among these are a design of a fireproof office building, 11 stories in height, for the New York Central & Hudson River, at Forty-second street, New York; one for a Union station at Memphis, Tenn., 80 ft. × 560 ft., with a train shed 112 ft. × 800 ft.; one for the Union station for the Concord & Montreal at Manchester, N. H., 64 ft. × 290 ft.; also, for the Union station at Augusta, Ga., 60 ft. × 320 ft.; at Hartford, Conn., for the New York & New England, 60 ft. × 220 ft., and many others.

Nor is it in large and expensive buildings alone that Mr. Gilbert has been successful. He has designed many exceedingly pretty ones at a surprisingly small cost. For instance, the station of the Concord & Montreal, at New Boston, N. H., of which the total contract price was $2,800; one at Essex-Fells, N. J., for the Coldwell & Essex, for less than $3,000, and one at Grovetown, Ga. for the Georgia Railroad, costing about $5,000. This latter has the novel and picturesque feature of an old-fashioned windmill for pumping water.

The last part of the book is a supplement, containing various drawings of buildings other than railroad structures, which has been added by special request. These drawings are of public buildings, club houses, hotels, churches, interior sketches and a full set of the buildings of the Atlanta Exposition. All of these latter, with one or two exceptions, were designed by Mr. Gilbert.

Problems in the Use and Adjustment of Engineering Instruments; Forms for field notes; General Instructions for extended Students' Surveys. By Walter Loring Webb, C. E., Assistant Professor of Civil Engineering in the University of Pennsylvania. New York: John Wiley & Sons, 1895. Pages 64; pocket-book, morocco with flap. Price $1.

Mr. Webb explains that this little book is the outgrowth of difficulties experienced by him in teaching the first elements of instrumental practice to engineering students. The problems which he gives have had the benefit of revision after two years' use, and their design is to keep each student busy at some definite work for which he has definite instructions and to thoroughly utilize the limited time available for this work. The book is not intended to replace any general text book on surveying, but simply to supplement general instructions by such definite directions that the students may work alone.

It appears to us that the little book is admirably calculated for the uses for which the author has designed it. He takes up one by one the instruments used in field surveys and gives examples of practice in the use of these instruments, and in their adjustment, with forms for field notes. For instance, under Transit Practice appears first the problem of angle measurements. The student is instructed how to point and read the instrument, how to keep the notes, how to get the means of the readings, and to compute the probable error. He is not instructed, however, how to set up and level the instrument, which may perhaps be a matter too obvious and too much an affair of "knack" to need to be put into print. Then the author continues the instructions in the transit by explaining the method of traversing, then the method of rod alignment, and finally methods of test adjustments. This division is followed by a couple of problems in the use of the transit with the stadia, then with a solar attachment. Other instruments are taken up in a like manner. The book ends with a chapter on the management of a student's topographical-hydrographical survey, and another on the management of a student's railroad survey. We have no means of estimating the value of the book for teachers, but for student engineers in college and out of college it ought to be very useful. At any rate, some of us would have considered ourselves fortunate to have had such a book a good many years ago.

Master Car and Locomotive Painters' Association. Proceedings of the 26th Annual Convention; September, 1895. Published for the Association by the *Railroad Car Journal*, New York.

This is a volume of 107 pages, giving a full report of papers and discussions at the convention, the constitu-

tion of the organization, lists of officers and members with an index. It has the distinct merit of being bound in a permanent way.

TRADE CATALOGUES.

Frogs, Switches and Crossings. Catalogue No. 4 of the Weir Frog Co., Front, Smith and Water streets, Cincinnati, O. 1896.

This company has been long and well known as making all kinds of track material for steam roads, electric roads, cable roads and horse car lines, as well as light-rail, portable track for mines, mills, etc. The catalogue which is now issued has been increased by about 40 pages more than were contained in the last catalogue and about 80 new cuts. Especial attention is called to 30 new illustrations of improvements covering stiff and spring-rail frogs, crossings for steam railroads and street roads; split switches; a new derailing device for street cars and new steel rail braces for high rails. Furthermore, the tables of general information have been corrected and added to. Of these there are 22, giving data for turnouts and crossovers, bills of ties for the same, weights of rails and rail fastenings of various sizes per yard and per mile, middle ordinates for curving rails and other useful matter.

We shall not attempt to describe further the contents of the catalogue, which covers 273 pages, but it is really a treatise on this sort of work. We would call attention, however, to the Weir patent for constructing points in rigid frogs, also to the recent improvements in spring rail frogs. Concerning these we are informed that in the past 14 years the company has made at least 30 different improvements and it submits in the catalogue 10 different designs from which to choose. Of crossings the company has got up a dozen different designs in past years and has now settled on five as being the best that can be suggested. The rapid growth of street railroad systems has necessitated a good deal of ingenuity to provide crossings of street railroads with steam railroads.

One device shown which seems to us excellent is a derailer for electric roads crossing steam roads. This is for double-track, electric roads and makes it imperative that the conductor of the electric car should go forward and cross the steam railroad track and himself hold the derailing switch closed for his car to proceed. The lever is placed in the middle of the electric track. Consequently, it must be turned down and the track again broken before the electric car can pass the point where the lever is placed.

Pennsylvania Railroad—Improvements in Line.

Mr. W. H. Brown, Chief Engineer of the Pennsylvania Railroad, has asked for proposals from contractors for important changes of location on several divisions east of Pittsburgh. The work to be contracted for includes changing a line from Kinzer's, a station 54 miles from Philadelphia, to a point west of Gordonville, Pa., and for a new line west of Rheems station about 26 miles beyond Gordonville, and 20 miles east of Harrisburg.

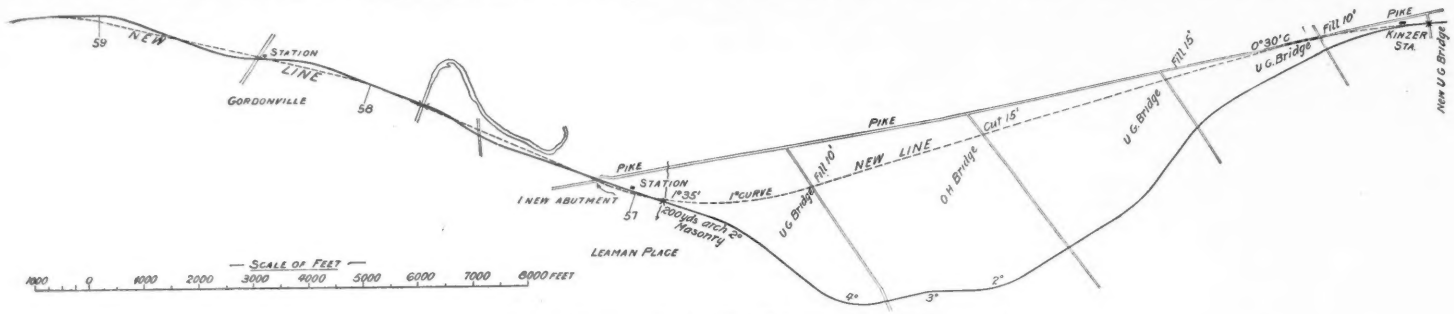


Fig. 1.—Kinzer to Gordonville, Philadelphia Division.

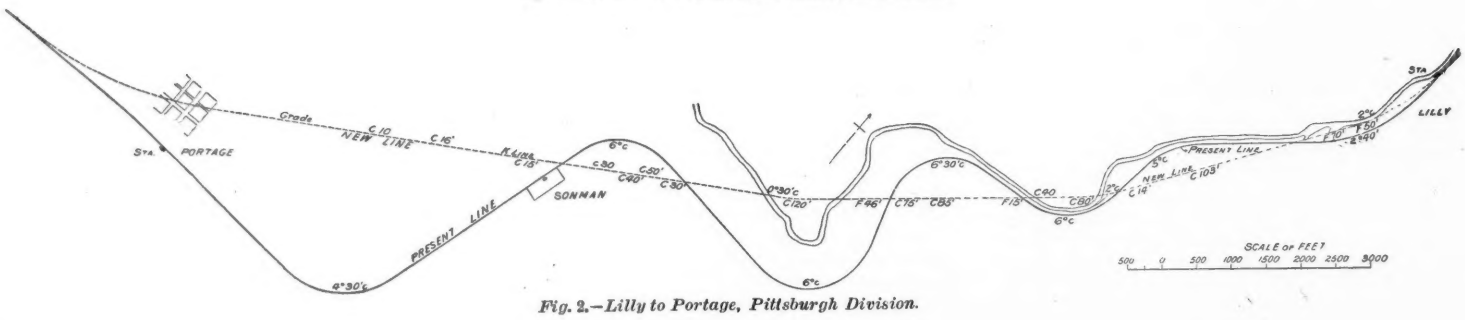


Fig. 2.—Lilly to Portage, Pittsburgh Division.

Changes in Location of Pennsylvania Main Line.

Plans and specifications for this work can be seen at the office of W. B. Prichett, Assistant Engineer at Mt. Joy, Pa.

On the Pittsburgh Division two important changes are to be made, the first between Lilly and Portage stations, plans and specifications for which can be seen at the office of C. S. d'Invilliers, Assistant Engineer at Altoona. The other work is for constructing the new line at Radebaugh, about 30 miles east of Pittsburgh, including a tunnel 2,100 ft. long and for a new line between Conemaugh Furnace and Nineveh. Contractors, bidding on the work, must examine in person all work for which they bid, and proposals are to be made on blanks furnished by the railroad company. The time given for completing the work will be an important consideration in awarding the contract.

The accompanying cuts show some of the details of the work. Fig. 1 shows the relocated line between Kinzer's and Gordonville, and the extent of the cuts and fills required as well as the overhead and under grade bridges. The grading of the new line will involve 300,000 yds. of excavation and 300,000 yds. of embankment. The construction of this new line will take out considerable curvature between Philadelphia and Harrisburg. The

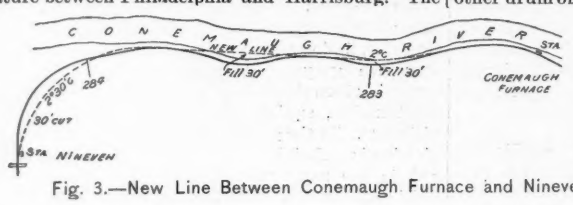


Fig. 3.—New Line Between Conemaugh Furnace and Nineveh.

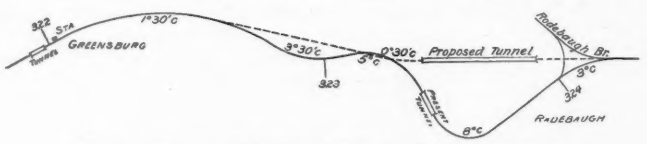


Fig. 4.—Change of Line and New Tunnel at Radebaugh.

rest of the work is on the west side of the Allegheny Mountains. Fig. 2 shows the new line between Lilly and Portage, the first named station being just beyond Cresson and the Gallitzin tunnel. Between the two towns named, the new line will shorten the distance 1.11 miles, and will save 444 degrees of curvature as well. A good deal of bridging will be required by the numerous crossings of the Conemaugh River. Between Conemaugh Furnace and Nineveh, an important change is to be made, as shown in Fig. 3. The present approach to the Nineveh station is to be changed, and a curve of less radius obtained by making a 30 ft. cut. Fig. 4, shows the change to be made at Radebaugh, the elimination of three curves, one of eight degrees, one of five degrees and the third of three degrees, by building a 2,100 ft. tunnel. A short tunnel on the present line is done away with.

An Accident at the Tilly Foster Mine.

On Nov. 29 a large quantity of rock fell from the hanging wall of the Tilly Foster mine, near Brewsters, N. Y., killing some 14 miners and injuring nine others. The working of this mine is so bold and interesting from an engineering standpoint that it may be worth while to give some particulars of it, although it must be measurably familiar to engineers.

It is a valuable body of magnetic iron ore extending from about 165 ft. below the surface to about 600 ft. down, and for years it was worked by the familiar methods. About 1887 or 1888 it was decided to open the mine to the surface and work it as a quarry. This involved stripping a large area down to the 165-ft. level. The surface opening is, roughly, 600 ft. long by 350 ft. wide, and the rock removed aggregated about 500,000 tons, which was stripped at a cost of over $250,000. In some parts of the mine, where the greatest width of ore body occurs, the stripping had to go even deeper than the 165 ft. level. The new hanging wall varies from vertical to an inclination of 1 in 6, and generally it has been found safe. Daily inspections are made and any threatening rock removed.

A very remarkable installation of cableways was put in when the mine was reopened under the supervision of Mr. Clinton Stephens, of the firm of Stephens & Arnold, the contractors for working the mine, which is owned by the Lackawanna Iron & Coal Co. The four cableways were built by the Lidgerwood Manufacturing Co., of New York. These cables have various spans, going up to as great as 365 ft. They carry "skips" which are lowered into the mine, loaded and hauled up. At the time of the accident the greatest depth of working had reached about 400 ft. from the surface. Each cable carries a trolley which is moved back and forth by a traversing rope passing around one drum of the engine. Another drum of the same diameter carries the fall rope which hoists the rock up out of the pit. The engines are combined link motion and friction, and the engineer can move his load horizontally or vertically at will. There are two inclined traversing cables, which have one end passing over a tower on the bank and the other anchored in the foot wall about 100 ft. below the surface. In this system the movement of the trolley in its descent is regulated by a stop block, the location of which on the cable is contolled through a tail rope by the engineer, one drum being made to raise the load vertically out of the pit and also along the inclined cable to the surface. The car bodies are lifted from their trucks, lowered into the pit, exchanged for loaded ones, and the latter are raised to the surface, lowered on their trucks and run to the dumps. About 1,000 tons of material have been handled in 10 hours. It was expected that some 600,000 tons of ore would be recovered by the opening of the mine, but later estimates have placed the amount at 1,000,000 tons.

Since this plant was put in the Lidgerwood Company has made great improvements, and there is no doubt that two traveling cableways, such as are employed on the Chicago Drainage Canal, would do the work now done by the four cables at the Tilly Foster.

Coal Consumption on French Street Railroads.

Comparative figures of coal consumed per car-mile run on French street railroads, employing different methods of propulsion, are contained in an article on electric roads by E. Cadiat in the *Portefeuille Economique des Machines* of October and November of this year.

Storage Battery Traction.—On the lines at Paris from St. Denis to the Madeleine and from the Opera to Neuilly the car-mileage aggregated in 1893 502,060 or per day 1,376 car-miles. (The cars have room for 50 passengers.) The steam engines at St. Denis furnished for this service 250 H. P. 23 hours and 125 H. P. six hours, a total of 6,500 H. P. hours, or 4.72 H. P. hours per car-mile. Mr. Badois, who reported these figures, gives 2.75 lbs. of coal as the consumption per H. P. hour and arrives at 12.98 lbs. of coal per car-mile.

Trolley.—At Marseilles, during the first two weeks of operation, 150,348 lbs. of coal were consumed to run 19,970 car-miles, and during the second two weeks 150,975 lbs. for 18,983 car-miles. The average is 7.73 lbs., which, however, includes the coal used in lighting the cars and the power station.

At Havre the following figures were obtained during October and November, 1894: It took from 1.75 to 2 H. P. hours to develop a kilowatt hour; 1.28 kilowatt hours were consumed per car mile, or from 2.24 to 2.56

H. P. hours, equivalent to about 6.72 lbs. of coal. The cars have room for 50 passengers.

At Milan, with cars having room for 34 passengers, 0.88 to 0.91 kilowatt hours, or 1.6 to 1.76 engine H. P. hours, or 4 6 lbs. to 5.0 lbs. of coal produce one car mile. (From a paper by M. de Marchena.)

Compressed Air Traction.—The line at Nogent-sur-Marne has grades of 4, 4.5, 5.8 and 6.2 per cent. The cars have room for 50 passengers. Mr. Badois made a test from Oct. 29 to Nov. 4, 1894, and found 34.5 lbs. of compressed air consumed per car-mile.

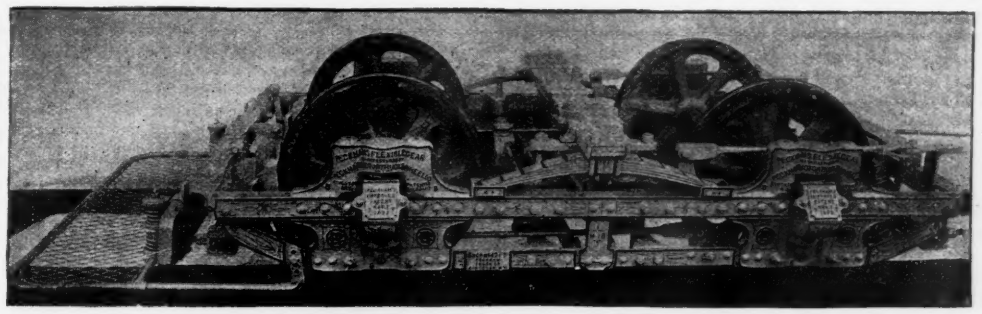
To arrive at the corresponding coal consumption, Cadiat makes the following considerations: In an engine, as there used, from 100 to 150 H. P., 17.6 lbs. of steam will develop 1 H. P. One H. P. delivered to an air compressor of good design, will produce 10 lbs. of compressed air at 600 lbs. per square inch the pressure adopted on said line).

Expressed in steam, the expenditure is, therefore, $34.5 \div 10 \times 17.6 = 60.7$ lbs., to which he adds $\frac{1}{12}$ for a certain loss, and arrives at 66 lbs. of steam consumed per car-mile, which, he states, can be generated in best French boilers with 4.8 lbs. to 5.5 lbs. of coal.

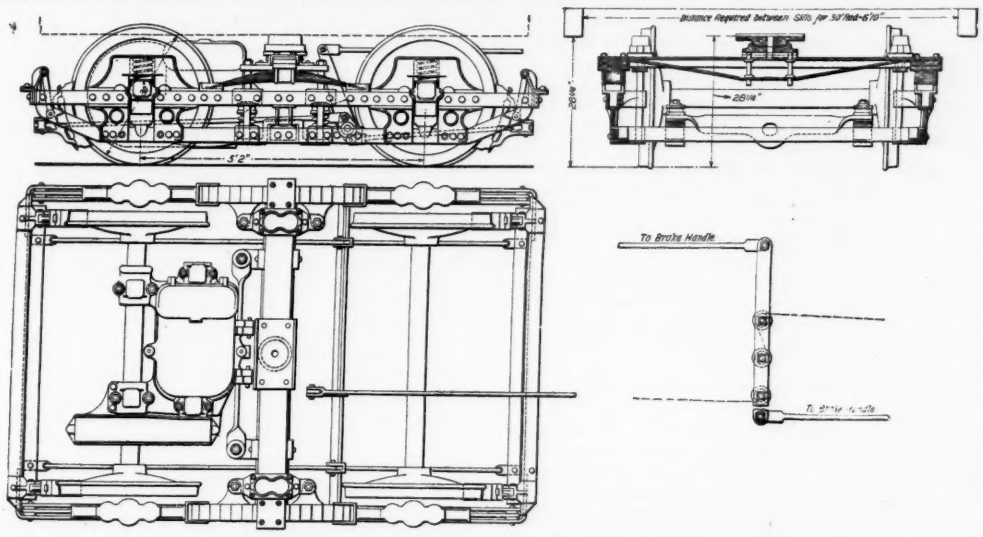
The Peckham Improved Swivel Motor Truck.

One of the most ingenious and enterprising of those who are engaged in building running gear for street railroads is Mr. E. Peckham, of the Peckham Motor Truck & Wheel Co. His designs are now familiar in many large cities of the land. The truck which we illustrate herewith is designed to meet the call for a motor truck to be used on lines now worked by steam and which can carry heavy car bodies, although the individual truck shown was built for a street railroad and is designed to hang the car body low in order to avoid the necessity for a double step.

The frame is heavy and is adapted to carry the standard railroad car of the steam railroads. The car body is supported by elliptic springs which rest on the side frames, and the side frames are hung on spiral springs, which, in this case, are carried over the journal boxes. In a motor truck it is important to provide against the shocks transmitted to the car body and also against those transmitted to the motors, and the arrangement of springs adopted for this truck relieves the blow which the motors would otherwise receive. In addition they are cushioned on springs set on the motor suspension as shown in the engravings. The brake rigging is so arranged as to permit motors to be placed on both axles. It is believed by the designer that the suspension of the motors on this truck will give the best obtainable tractive results.



The Peckham Improved Swivel Motor Truck.



Details of Peckham Improved Swivel Motor Truck.

Continuous Rails on Street Railroads.*

Two well-known methods are now in use for producing continuous rail joints. The first of these is the method of electric welding. This has been so often described in the past that we make no abstract of this part of Mr. McCulloch's paper. Another and a somewhat newer method is that of cast welding. It has been before briefly described in the *Railroad Gazette*. The process is under the control of the Falk Manufacturing Co., of Milwaukee. The ends of the rails are clasped for 8 in. on each side of the joint by a mold, which mold is then poured full of molten iron. The iron solidifies on the rail around the joint and also makes a partial union with the rail metal. In the fall of 1894 the St. Louis Railroad Co. had three miles of track in the southern part of the city connected by this process, and the cars of the Southwestern Railway are at present running regularly over this track. On account of its excellent record during last winter, the officers of the Citizens Railway Co. of St. Louis, have decided, in relaying their old cable track, to use the cast welded joint. This road was originally laid with 4-in. 52-lb. Johnson girder rails. In changing from cable to electricity a 7-in. 85-lb. Johnson girder in 60-ft. lengths was used. Two specially trussed wagons with wheel bases of 45 ft. were designed and built for hauling these rails. The curves were made of 6-in. 97-lb. girder rails, and all curves of less than 400-ft. radius were designed with a spiral easement at each end and were double guarded. Curves of from 400 to 1,200-ft. radius have a guard rail on the inside only, while those of still greater radius are formed by bending the straight rails. The new rail being 3 in. higher than the old, it was not laid upon the old yokes, but upon ties. The track is joined temporarily by fish plates, tamped, lined, surfaced and completely finished in every particular before the joints are cast. The apparatus for casting consists of a cupola furnace mounted on a heavy truck and a Sturtevant blower running 1,800 revolutions per minute driven by an electric motor. The iron used is one-half best soft gray pig and one-half selected scrap. In 20 minutes after the blast is turned on the iron is ready to pour. In the work on this road about 1,200 ft. of track has been repaired, and all the joints molded in one heat. As many as 72 joints have been poured at one melting, and it is probable that 90 or 100 could be made before shutting down the furnace to renew the lining.

To prepare the rail ends for the joints, the fish plates are taken off, and the ends of the rails polished with garnet paper for about 8 in. back, and the opening between the rail ends is closed by shims. The molds are then placed in position and clamped tightly. They are left on until the iron which has been poured has cooled. They are previously lined with a mixture of linseed oil and plumbago and heated to drive out moisture. It takes about three hours to pour 40 joints. The casting weighs 137 lbs., and extends back on the rail 7 in., taking in two bolt holes in each rail end, and in this way casting four bolts through the rail. An examination of a joint sawed through, shows that it is nearly impossible to detect the point of difference between the iron and steel.

In actual operation the following results have been obtained: The Baden road built in the spring of 1894 with electrically welded rails had in all 2,203 joints. Of these 72 or 3.27 per cent. have broken. Thirty-seven broke during the cold weather of the first part of the winter and were afterward repaired by the cast welding process. During the heat of summer no trouble whatever was experienced with the alignment of the track. This track was laid during an average temperature of 63 degs. and the range of temperature through which the track has passed is 112 degs. The maximum deviation from the average welding temperature was 75 degs. Some of the joints were broken open nearly two inches, the opening in many other cases being almost imperceptible. The average was about ¼ of an inch. Every joint which has broken has shown itself to have been an imperfect weld. No good welds have broken, nor have the rails themselves broken in any case. This is explained by the fact that the process was new at the time the work was done, the workmen were inexperienced or careless, and the voltage at a long distance from the power house was low.

Experiments made in Cleveland show that during the summer of 1894, 3,000 joints were made electrically, two-thirds of these on 56-lb. rail, the remainder on 90-lb. rail. The total breakage during last winter was six—four on the 56-lb. and two on the 90-lb. rail. The percentage of breakage was 0.18 per cent. All broken joints showed themselves to be imperfect welds, attributed to carelessness on the part of workmen.

The cast-welded track of the Southwestern Railway, on Chippewa street, was welded during October and November, 1894. The average temperarure during the work was 51 degs., maximum 84 degs., minimum 18 degs. There were 744 joints. During the winter three broke, or .43 per cent. in all. No deviation from alignment has been perceived. Since laying this track the temperature has ranged from 100 degs. maximum to 12 degs. minimum, a range of 112 degs., and a maximum deviation of 63 degs. from the welding temperature. Further results with the cast joint show in Chicago, for the Chicago City Railway, 11,903 joints on 4½ and 7-in. rail, and for the West Chicago Street Railway Co., 8,867 joints. In St. Paul, Minneapolis and Newark each about 2,000 joints have been made. The records so far have been very satisfactory both to the railroad companies and to the contractors.

It should be noted that the problem of using a continuous rail is much simpler in street railroad than in steam railroad work. The perimeter of a 7-in. girder rail is 29 in., of which 22.4 per cent., or about 6½ in. only, is exposed, the remaining part being covered up and firmly gripped by the roadbed. This in time becomes solidified and cemented to the rail, and is very efficacious in preventing creeping, etc.

A calulation of the stresses in rails due to the variations of temperature is as follows: Assume a co-efficient of expansion for steel of 0.0000065. Multiplying this by 75, a liberal figure for the number of degrees of maximum deviation from the welding temperature, we get 0.000487, which is the part of its length which a rail would expand or contract during a change in temperature of 75 degs. Under a load of 1,000 lbs. per square inch a steel bar will expand 0.00003 of its length. Dividing the estimated expansion by this figure, we get 16,200 lbs. per square inch for the stress. The total pull in a rail with 8¼ in. cross section is 137,700 lbs. Since 40,000 lbs. per square inch is a safe value for the elastic limit of steel it may readily be seen that this will not be reached in our climate, which means that expansion and contraction may continue indefinitely without harm to the rail. Assuming 80,000 lbs. per square inch ultimate strength, we have, as far as the strength of the rails themselves is concerned, a safety factor of about 5. To show the friction with which the roadbed holds the rail, each continuous rail in the Baden track should have contracted throughout its whole length 8 ft. 6 in. The breaks, summing up the combined openings in one rail throughout the length of the road, did not exceed 6 in., which would show that the joints were broken by a local and not a transmitted cumulative effort.

To show the strength of the cast iron joint, the area of the cross section at this point is 61.6 sq. in. Reduce this 25 per cent. on account of supposed blow holes and imperfections. This leaves 45 sq. in., which at a tensile strength of 18,000 lbs. for cast iron per square inch gives the ultimate strength of the joint as 810,000 lbs., which is largely in excess of the strength of the rail.

The author mentions as some of the advantages of the cast welding process, the relative simplicity and cheapness of the apparatus used, the ease with which men to do the work can be obtained, the lightness of the machine and the ease with which it can be transported, and the fact that it does not run on the track. He mentions two disadvantages, however, the possible imperfections, etc., in all castings, and the fact that cast iron and steel possess different co-efficients of expansion, which might cause internal stressess, resulting in rupture. No trouble of this kind, however, has developed in the use of the metal for rail joints.

An advantage of any system of continuous track over and above the smoothness obtained is the conductivity which the track has, it having been proved that the joint is as good a conductor as the rail. A double track of four rails would have a conductivity of 6,000,000 circular mils, which is largely in excess of the feeder section of any line of railroad in St. Louis. The combined section of the feeders for the Citizens' Line, calculated for 60 cars, and allowing a drop of 50 volts at full load, is 3,200,000 circular mils. This obviates danger of electrolysis o water pipes.

* From a paper by Mr. Richard McCulloch, read before the Engineers' Club of St. Louis, Oct. 2, 1895.

TECHNICAL.

Manufacturing and Business.

The Chicago grain door was specified on the last 600 box cars let by the Illinois Central to the Wells & French Co., also on a number of the Norfolk & Western cars being built by the Lenoir Car Co.

The Coughlin-Sanford Switch Co., of Virginia, has been incorporated by Edward W. Coughlin, Harry C Sanford, T. Noll Poullain, Charles W. Field and John I. Middleton.

The Phœnix Steel Wire Broom & Brush Co., of Chicago, reports increased sales of its Isaac's patent steel wire track broom for locomotives These brooms are strongly constructed of heavy steel wire. They can be raised from contact with the rails by means of a cam attached to the broom spindle and operated by a lever from the cab. The wire bristles are cut in such a shape as to act both as a track cleaner and a flanger.

The Huyett & Smith Manufacturing Co., of Detroit, a firm of long standing as manufacturers of fans, blowers, etc., is to be succeeded by the American Blower Co. The change is merely one of name, the same officers continuing with the new company, except that Mr. W. D. Smith, Vice-President of Huyett & Smith, withdraws. As Mr. Huyett has not been connected with the firm for 10 years, the old name was meaningless. D. M. Perry is President of the American Blower Co., organized to carry on the business. A. E. F. White is Vice-President, and James Inglis is Secretary and Treasurer.

New Stations and Shops.

The plans for the new passenger station at Charlotte, N. C., have been completed and bids are now being received. The building will be a large two-story structure of brick, with brown-stone trimmings and slate roof. There will be separate waiting-rooms for whites and negroes on each side of a hall, at the head of which will be the ticket-office. On the second floor there will be the local offices, engineer's dormitory, telegraph office, etc.

Contractor Mathias Geist, of Pottstown, Pa., has received the contract for the erection of a coach-paint shop at Reading for the Philadelphia & Reading. The building will be of brick, 80 × 216 ft.

The machine shops of the Atlantic & Danville road, just erected at Lawrenceville, Va., were opened last week. The shops, for which the city gave $150,000, were removed from Portsmouth.

The New York, New Haven & Hartford, it is announced, will build a new station at Stamford, Conn., next year, having secured the land required for the station buildings and the track improvements for $85,000, after a good deal of litigation, resulting finally in the beginning of condemnation proceedings.

Iron and Steel.

Griswold & Gillett, New York agents for Charles Cammell & Co., of Sheffield, England, are reported to have sold 10,000 tons of steel rails of English make in this country for use on an American road. It is believed that this is the first large sale of English rails in this country under the present tariff laws.

On Dec. 1 the western half of the main building of the Ajax Iron Works, at Corry, Pa., was destroyed by fire. The damage was confined principally to the carpenter shop and erecting room, which, with their contents, were totally destroyed. Partial losses were sustained on all three floors of the main shops. The total loss is estimated at $10,000, fully covered by insurance.

The Iron and Steel Market.

The general impression throughout the iron trade seems to be that not much improvement can be expected for the remainder of the year. Buyers are still holding off, and production is increasing.

The relatively high price of rails, as compared with other forms of steel, has two noticeable effects. One is the small number of orders received, another is the demonstration of the possibility of English competition, if not in the East, at any rate on the Gulf and Pacific coasts. The recent order for 10,000 tons of rails, placed with Cammell & Co., of Sheffield, Eng., supposed to be for the San Joaquin Valley Railroad, is the first important order taken by English makers against the American Steel Rail Association since 1888. It follows an unsuccessful attempt made by the same firm last spring to secure an order placed by the above railroad, which order was taken by the Lackawanna Iron & Steel Co., of Scranton, Pa., at $22.75 per ton, on dock at Jersey City. Since then American rails have gone up to $28.75 at tide water. English rails at present prices at their mills could be sold at our Atlantic ports at about $31 a ton. They can, however, compete on the Pacific Coast, unless the Steel Rail Association cuts its prices, a common proceedure under the circumstances, and one which it seems strange was not followed in this instance.

We note two small rail orders, one from the Baltimore & Ohio Southwestern for 1,000 tons, and one from the Union Pacific, Denver & Gulf for 2,500 tons.

Testing the Power of 13-inch Guns.

Some experiments are soon to be made at Indian Head to determine the penetrating power of a 13-inch gun and the resistance offered to the same by the turrets of such vessels as the battleships Indiana, Oregon and Massachusetts. The 13-inch gun is the largest caliber gun used in our navy, and is larger than that adopted by the British Navy, their maximum bore being 12 in. The tendency in recent years has been to reduce the size of bore. Some of the earlier Armstrong built up rifles had a caliber of 16 in.

The recent tests of the side armor of the battleship Oregon showed that the 12-inch guns were not capable of damaging it appreciably, although a 13-inch gun sent a shell completely through it and the backing and 7 ft. into the earthwork in the rear. The turret test will be about as follows: The turret will be built of cast iron, its sides representing a thickness of about 26 in. Upon one face of it will be fitted one of the test plates furnished by the armor makers. Dummy 13-inch guns will be mounted in the turret, so that the effect of the shots upon them may be observed. The 13-inch projectiles will weigh 1,100 lbs., and will be fired with a charge of 500 lbs. of powder, producing a velocity of about 1,800 ft per second.

An Electric Railroad in Berlin.

The first electric railroad in Berlin has recently been opened. This line is three kilometers long (say 1.9 miles). It has an overhead conductor, is double track and its steepest grades are 1 in 300.

The Madras Harbor Works.

The Engineer's Report on the Madras Harbor Works for 1894 and 1895 describes the completion of the great north pier, with a concrete lighthouse at its head. This pier is 3,817 ft. long and was begun in 1876. The outer portion of over 80 ft has been raised to a height of 13 ft. above mean sea level by putting on concrete blocks, made in position, each weighing about 250 tons.

The Simplon Tunnel.

The question of building the Simplon tunnel goes on slowly, but it is believed surely towards actual work. On the 11th of last month a conference of representatives of the company and of the Swiss and Italian Governments assembled at Berne. Of the results of the conference we have so far heard nothing. Italian papers which appear to have official inspiration have represented that the Italian Government is very much interested in facilitating progress in every way. So far, however, the financial aid of the cities of Milan and Novara had not been secured.

Tie Plates.

The Q & C Company has sent out a circular setting forth a few facts concerning the tie-plate situation. The circular states that the essential feature of the Servis tie plate is the longitudinal under flanges, and that the Servis patents broadly cover any form of flange or projection on the under side of the tie plate so arranged that when the plate is in position the flanges or projections will enter the tie longitudinally, or parallel with the grain of the tie. It is claimed that any form of plate possessing these features is an infringement of the Servis patents, and the company announces that it will protect those patents. While the company will regret to take legal proceedings against any railroad it will feel compelled "to use all the repressive means known to the law against any one found using tie plates that in any degree infringe upon the Servis patents."

Liquid Fuel Apparatus for Locomotives.

Messrs. Taite & Carlton, 63 Queen Victoria street, London, Eng., have just issued a pamphlet describing the applications of Holden's system of liquid fuel burning. Drawings of the injector or burner and its attachments to locomotives, stationary and marine boilers are shown, and the necessary directions for putting on these injectors are given. In this system the liquid fuel and air are introduced above a thin layer of solid incandescent fuel and burnt in combination with it. It may also be used alone, and in either case alteration on of the firebox or furnace is necessary. A description of this—the fullest description we have ever seen—was published in the *Railroad Gazette*, Feb. 26, 1892.

Mineral Wealth of Newfoundland.

It is said that a large coal area, 12 miles long by six broad, has been discovered on the new line of railroad to the west coast of Newfoundland, and 40 miles by rail from the Bay of Islands. The geological surveyor estimates that one seam alone, which is 4 ft. wide, contains 11,000,000 tons of excellent cannel coal. Six other seams have not yet been fully traced. According to a letter from Judge Prowse, the historian of the island, recently published, iron is found in Newfoundland in great abundance. A deposit at Belle Isle, about 12 miles from St. John's, is now being worked by a Nova Scotia syndicate with a yield of nearly 60 per cent. of metal. Near St. George's Bay there is a still larger iron ore deposit, which has been graphically described as a whole mountain of iron. Asbestos exists in large quantities near the railroad line at Labrador; borings for petroleum are now being made, with good prospects. Lead and other minerals are known to exist in paying quantities. The copper mines at Tilt Cove are well known. All of these industries will be vitalized by the recent coal discoveries.

A Large Wharf Shed.

Press reports say that the Edge Moor Bridge Works has secured the contract for building a large shed over the wharves of the Boston Steamship Co., along the Delaware River at Wilmington, Del. The shed will be 129 ft × 510 ft., and will cost about $40,000.

The Motocycle Contest in Chicago.

The motocycle contest, which was to have taken place in Chicago about Nov. 1, and which was afterward postponed to Thanksgiving Day, took place at that time under very unfavorable conditions. The contest was originated by the Chicago *Times-Herald*, the prizes amounting to $5,000. At the time of starting, the streets were several inches deep with snow, slush and mud, but in the face of these odds six vehicles made the start. They were as follows: The Duryea gasoline carriage, of Springfield, Mass.; the Morris & Salom electrobat, of Philadelphia; the H. Mueller motocycle (Benz type), of Decatur, Ill.; the R. H. Macy motocycle (Benz type), of New York; the De la Vergne vehicle, New York, and the Sturges electric motocycle, of Chicago

The contest was won by the Duryea machine which made the run of 54 miles in 10 hours and 23 minutes. The course was from Jackson Park to Evanston and return.

Three of the six starters finished. Both the Sturges and the Morris & Salom electric vehicles made no attempt to complete the course, satisfying themselves with runs of from 12 to 15 miles, returning to the starting point in good condition.

The prizes will be awarded on the showing made in the road race, and in the tests which have been made on short runs, to determine speed, etc. It is to be hoped that these tests will result in some reliable data concerning horseless vehicles.

New Process for Casting Steel Ingots.

A company is being formed in South Staffordshire, England, for producing small steel ingots by the process invented by Mr. Smith-Casson. Mr. Casson, who is the inventor of the Casson puddling furnace, read a paper on the new process at the Birmingham meeting of the Iron and Steel Institute. The new company proposes to erect at first two casting furnaces capable of producing 120 tons of castings each per week, but additional furnaces will be built as the demand increases. The ingots will be supplied to manufacturers for rolling down into bars and sheets in place of billets and blooms now so largely imported into Staffordshire from Scotland, Wales and the North of England. The castings will be particularly useful for stamping and working-up purposes. It is claimed that by this process not only will great economy be effected, but that the material is more malleable while possessing all the tensile qualities of the best ingot steel. The quality is guaranteed, and it is said to be perfectly free from red or cold shortness.—*Iron Trade Review.*

Tire Wear in England.

The driving tires in general use on the Great Eastern Railway are made of Bessemer steel, having a tensile strength of 40 tons per square inch, and the following composition: Combined carbon, 0.350 per cent.; silicon, 0.083 per cent.; sulphur, 0.064 per cent.; phosphorus, 0.047 per cent.; manganese, 0.605 per cent.; iron—by differences—98.851 per cent. The wear on the tires of some six-wheeled coupled suburban engines in severe service was such that only 2,197 miles was obtained per $\frac{1}{32}$-in. reduction in thickness, the tires being 4 ft. diameter. Consequently 17 of these engines were fitted in January, 1892, with special hard steel tires, having a tensile strength of 48 tons to the square inch, and the results obtained up to their first turning were satisfactory. The average mileage was 47,134 for an amount of wear equal to $\frac{1}{4}$ in. in thickness, or 5,892 miles per $\frac{1}{32}$ in. reduction.

THE SCRAP HEAP.

Notes.

The Pennsylvania Railroad has given to the Young Men's Christian Association the building in Camden, N. J., formerly occupied by the Third Street Methodist Church. The company will give the Y. M. C. A. $1,500 toward fitting up the building and $1,300 a year toward maintenance expenses.

Eastern people who still look upon the West as a new country may note the progress of time by the resignation, recently reported in a Kansas paper, of a freight brakeman of the Atchison, Topeka & Santa Fe who is 71 years old. He has been running between Topeka and Atchison a long time and has resigned to become a watchman in an elevator.

The wrecking of a trainload of soldiers in Cuba, Nov. 25, by the insurgents was accomplished by the use of dynamite. The bomb placed on the track was so large that the locomotive and the car next to it were literally torn to pieces, and the engineman, fireman and 13 soldiers in the first car were killed by the explosion. Eighteen other soldiers were killed by the derailment.

The hopper provided for the reception of new bills was promptly put in commission at Washington on Monday, Dec. 2, the opening day of the 54th Congress, and one of the bills in the first batch was that of Mr. Aldrich, of Illinois, making ineligible as receiver of a corporation engaged in Interstate commerce, any persons who have been officers or employees of the corporation at any time during the three years preceding.

One of the two very bad train accidents in 1894 was that at Lincoln, Neb., on Aug. 9, in which a passenger train fell through a trestle and 11 persons were killed, and the man who caused that wreck, George Davis, a colored person, has just been convicted of murder in the second degree, after a trial lasting several days. It appears that Davis intended to stop the train and secure a reward as the discoverer of an obstruction on the track.

A novel reply was made to a demand recently made upon the Cleveland & Pittsburgh Railroad. The town of Martin's Ferry, Ohio, asked that the railroad place watchmen at two grade crossings in that place. The railroad placed a man at each crossing, and found that the people not only crossed the tracks, but that they used them as a foot walk; and a three days' census showed that at one crossing, in three days, of 2,265 persons who crossed the tracks 954 used the tracks as a thoroughfare; while at the other, of 4,040 persons crossing, 1,151 used the tracks in that manner. The management then suggested to the city officers that if the tracks were sufficiently safe for 33 per cent. of the people of the town to use as a thoroughfare, they were safe enough for the remainder to cross, if due care were taken. The matter has been referred to the State Railroad Commissioner.

Purdue University.

Last Wednesday the new engineering laboratory at Purdue University was officially opened with appropriate ceremonies, which included a concert and dedicatory exercises in the morning and an afternoon reception by the President in the new building. It will be remembered that the mechanical laboratory at Purdue was destroyed by fire in February, 1894. We have already described at some length the plan on which the new laboratory has been built and equipped. Those of our readers who are interested in steam engineering, especially in locomotive engineering, have some idea of the valuable work that has been done and is still being done at Purdue University, and will join us in congratulating the trustees and faculty and students on the restoration and enlargement of the engineering laboratory.

An Automatic Ticket Seller.

Among the minor inventions for facilitating railway work, the automatic appliance for the delivery of railway tickets bids fair to hold a respectable place. The machine, which is the property of the Sweetmeat Automatic Delivery Company, works with absolute correctness, and dates as well as issues the tickets. It is particularly useful where a number of tickets has to be issued at fixed fares, such as for local passenger traffic. Some time ago a machine was fixed in the Homerton Station of the North London Line for the issue of workmen's tickets, and, as the directors have asked for further machines, the presumption is that the experiment has proved satisfactory.—*Herapath's* (London).

Lake Notes

It is claimed that the 432-ft. steamship building for the Escanaba-Ashtabula trade will carry 200,000 gross tons of ore in a season. Special dock arrangements are being made at the Lake Erie port for the vessel.

A cargo of 160,000 bushels of barley was taken from Duluth to Buffalo last week, the largest on record from Lake Superior. At the same time 146,000 bushels of wheat, 4,273 tons, were carried on a draft of 13 ft. 10 in.

Iron Ore Matters.

The largest charcoal blast furnace in the world will be put in operation at Gladstone, Mich., in March. It is now completed, and 1,200 tons of ore are daily being sent to its stock house. It is the property of the Cleveland Iron Mining Co., which has several mines on the Marquette range. The company owns thousands of acres of hardwood lands, and its charcoal kilns are arranged to save all the by-products of the wood.

Iron ore shipments from the Lake Superior region are closed, the final cargoes going from Escanaba, on Lake Michigan, this week. That port has kept its lead over all others, but its proportion of the total is far less than in 1892, when it sent out 45 per cent. of the 9,072,000 tons shipped. The port has fallen off materially because of strikes. Ashland has increased 128,000 tons over any preceding year, and Duluth and Two Harbors combined have jumped from 1,200,000 tons three years ago to 4,000,000. The records from the different ports are as follows:

Escanaba	2,900,000 tons
Ashland	2,550,000 "
Two Harbors	2,130,000 "
Duluth	1,850,000 "
Marquette	1,200,000 "
Total	10,430,000 tons

This total is half a million tons more than had been expected by the most sanguine.

The Uganda Railroad.

The special conference of engineers appointed by the British Foreign Office to consider the best means of carrying out the project of a railway from Mombasa into Uganda has reported. It is said that before finally accepting the suggestions of the engineers sent out by the last government the Foreign Office will await the report of a special body of engineers selected to go into the question of the best route on the spot. This is mostly in view of the specification that must be made prior to asking any contractors to undertake construction. The party left London on Nov. 15 for Mombasa under the charge of Mr. Whitehouse, C. E. It is hoped that the work may be commenced in the spring of next year, but long before that the necessary plant will have been stored at Mombasa; indeed, Sir Alexander Rendel has already, as consulting engineer, shipped some railroad materials to Mombasa. No rails have been sent yet.

An Estimate of Nicaragua Canal Tonnage.

Mr. Joseph Nimmo, Jr., formerly of the Government Bureau of Statistics at Washington, and well known through his writings on statistics, has issued a "supplemental statement" to his pamphlet on the Nicaragua Canal, in which he estimated the tonnage likely to be attracted by the canal, and the tolls which could be charged on the traffic using that route. Mr. Nimmo points out that a useful estimate of the tonnage likely to go through the canal can be arrived at by two methods: "The first is by computing the tonnage which would pass through such a canal upon the basis of shortest distance, using for this purpose the statistics of tonnage movement of the commercial nations of the globe. Then from a careful study of the commercial, nautical and other conditions involved, the necessary reductions must be made; for at this age a statement as to commercial movements on land, or on the sea, upon the basis of distance alone, is the sheerest nonsense. The longer route may be the cheaper even if it be several times as long as the shorter. . . . The second method of computing the tonnage of the projected canal is by taking the ship tonnage engaged in the present Panama Railroad transit, and adding to or subtracting from this amount as commercial and other conditions may require. This method of computation is adopted in my pamphlet of September. The proper basis upon which to make such computation is the tonnage of vessels arrived at and cleared from Panama, as the tonnage movement on the eastern side of the isthmus is made up largely of coastwise tonnage, connecting at Colon with steamer lines to and from Europe and Atlantic ports of the United States, and therefore does not represent trans-isthmian traffic. . . . The tonnage entered and cleared at Panama in the year 1877 amounted to 466,063 tons. The tonnage entered and cleared at Panama amounted, in 1864, to 364,416 tons; in 1875, to 547,480 tons; in 1876, to 420,871 tons.

"The Chief of Bureau of Statistics of the Department of State reports the tonnage entered and cleared at the port of Panama during the year 1893 as follows: Entered, 242,619 tons; cleared, 244,952 tons; total, 487,571 tons.

"In view of the facts stated in my pamphlet of Sept. 30, 1895, as to the commercial and nautical conditions involved, it is not probable that an American isthmian canal would develop more tonnage than is employed in connection with the present railroad transit. So it appears proper to estimate the present Panama ship tonnage at 500,000 tons annually. Adopting, then, the lowest estimate of the cost of the Nicaragua Canal, $100,000,000, the annual interest charge on that amount at 4 per cent. would be $4,000,000, and the interest charge per ton at 500,000 tons per annum would be $8. To this add $1.50 per ton for maintenance, repairs and operation, and we have $9.50 per ton as the charge for canal tolls." Mr. Nimmo concludes that the traffic likely to use the canal should not be calculated above 300,000 tons. "In a word, the scheme is without any commercial merit, and in that sense is chimerical."

German Mining Statistics.

Some official statistics having reference to the condition of the German mining industries in 1894 have just been published. It appears that during the year named there were employed in the mines 371,143 people, of whom 736 lost their lives while engaged in their work. In comparison with the previous year these figures show an increase of 5,885 in the number of persons employed, and of 85 in the number of fatalities. The coal mining industry accounted for 268,858 persons employed, and for 594 fatal accidents, there having been one fatality for every 119,129 tons raised, as compared with one for every 99,527 tons in the preceding twelvemonth. As usual, falls of roof were the principal cause of fatal injuries, 315 of the total number of deaths being due to these disasters, as against 303 in 1893. There has been a noteworthy decrease in the loss of life from firedamp explosions, only 26 men having thus been killed, as against 127 in 1893, and an average over the past ten years of 103. Like our own, the German mines seem to grow safer year by year.

The World's Ships.

The annual statistics of the "Bureau Veritas" relating to the mercantile navy of the world, which have just been published, give the total number of sailing vessels now afloat measuring over 50 tons as 25,570, with an aggregate tonnage of 9,323,995 tons. Of this number Great Britain comes first with 8,793 ships of 3,333,607 tons. The United States is second with 3,824 vessels and 1,362,317 tons. Norway is third, with nearly one thousand less vessels than the United States, but nearly the same amount of tonnage. France occupies only the eighth rank, between Sweden and Greece. In regard to the steamers, England counts 5,771 vessels with nearly 10,000,000 tons. Germany, which comes second, has 826 steamers of 1,306,771 tons, France third with 501 steamers and 864,598 tons, while the United States holds fourth place with 447 steamers and 793,399 tons. These figures relate only to ocean and seagoing vessels, and do not include coasting craft or those employed in lake and inland navigation.

South American Notes.

The new President of the Argentine National Railway Board is Mr. Charles Maschwitz.

The Buenos Ayres & Rosario Railroad Co. has built two buffet cars at its shops in Campana.

The best topograpical map of the Argentine Republic issued up to the present time is one just published by George Phillips & Son, of London. The original was drawn by Senor H. D. Hoskold, C. E., of Buenos Ayres, formerly Inspector General of mines in Argentina. It is published in 10 sheets on a scale of 1–2,000,000.

The report of the Special Guaranteed Railways Committee of Argentina shows that the government is indebted to the seven guaranteed lines of the republic to the amount of $10,722,632 gold.

The long talked of cable up the Amazon from Pará to Manáos, 1,100 miles from the mouth of the river, will soon be an accomplished fact. Final arrangements are now being made by Mr. Alexander Siemens for the Amazon Telegraph Company, Limited, and the steamer Faraday will sail from England during November with cable and appurtenances on board. There will be 16 landings of the cable at important towns between Pará and Manáos. This is unquestionably the most important event that has ever happened in the Valley of the Amazon, and must produce enormous results in the development of that region. Manáos is in the heart of the rubber-producing country, and only the lack of communication with the markets of the world has prevented its development into the great shipping port of the Amazon. It is a city of about 14,000 inhabitants, is beautifully situated on high ground on the northeast bank of the Rio Negro, 10 miles from its confluence with the Amazon, and has an excellent harbor, with 30 ft. of water from that point to the sea, at low stages of the river.

The North Sea and Baltic Canal.

The discontent with the management of the Kiel Canal continues to increase in those German communities which expected considerable benefits from the opening of the waterway, and have failed to secure the looked-for increase of shipping. The vessel and mercantile community of the port of Stettin, following the example of the Kiel Chamber of Commerce, has addressed a memorial to the Minister of Commerce on the subject of the traffic through the canal. When the Kiel memorial was drawn up only the traffic returns down to the end of July were available, but the Stettin document deals more especially with those for the month of August. The memorial says:

"The traffic returns for August, during the whole of which month the canal was available for vessels having a draught up to 21 ft., show that 718 vessels, the total measurement of which was 115,668 registered tons, passed through, against 500 vessels and 74,000 tons in the month of July. This result is very far indeed from what had been expected. Of the 718 vessels, only 295 were of a measurement superior to 100 tons, the aggregate tonnage of these being 97,356 tons, and the majority of them, viz., 174 ships of 57,199 tons, or nearly 59 per cent. of the whole traffic, were bound either to or from Hamburg. The cause of the scanty traffic is still to be sought in the too heavy canal dues. The saving of time, too, is becoming less as the nights get longer, owing to the fact that the electric lighting is very defective. As regards the size of the vessels which have used the canal, the returns show that in the month of August it was principally patronized by vessels up to only 500 tons measurement. It is clear that the passage through the canal is a paying operation only in the case of small vessels, and even in their case only so far as the traffic between Hamburg and Kiel is concerned; there is no appreciable profit attending the passage when other ports come in question, and when the stoppage of traffic during the night is taken into account the result in most cases must be a loss."

LOCOMOTIVE BUILDING.

The Jacksonville, Louisville & St. Louis has recently ordered an eight-wheel locomotive, with 17 in. × 24 in. cylinders, from the Baldwin Locomotive Works. The engine weighs 96,000 lbs., with about 60,000 lbs. on the driving wheels. The wheels are 63 in. in diameter, steel tired, with Baldwin wrought iron centers. The American Brake Co.'s brake is to be applied on each driving wheel. The specifications, relating to crown staying, say: Crown staying, supported by crown bars, each made of two pieces of wrought iron with solid ends; no cast toes on bars; 5½ in. × ¾ in., set 2 in. above crown; placed not over 4½ from center to center and bearing on side sheets.

CAR BUILDING.

The Mexican Central is reported in the market for 150 box and 50 stock cars.

The Lake Erie & Western has just completed at its own shops, in Peru, Ind, 50 refrigerator cars for a brewing company of Cincinnati.

The Pullman Palace Car Co. has recently received orders for 400 ore cars for the Duluth, Missabe & Northern, and for 25 passenger coaches from the Metropolitan Elevated Railroad, of Chicogo.

BRIDGE BUILDING.

Annapolis, Md.—The Board of County Commissioners, on Nov. 26, authorized the preparation of plans and the advertising for bids for an iron bridge over Furnace Branch, near Glen Burnie, in Anne Arundel County.

Astoria, Ore.—Sealed plans, specifications, strain diagrams and bids will be received until Jan. 6 for building a bridge across the Lewis & Clarke River in Clatsop county. Certified check, 10 per cent. F. I. Dunbar. County Clerk.

The contract for building a drawbridge over the Young's River has been awarded by the Northwestern Construction Co., to Robert Wakefield and William Jacobson, of Portland, Or., the contract price being about $20,000. The bridge will be 4,000 ft. long principally trestle work.

Blaine, Wash.—The County Surveyor has been ordered to locate and take measurements for a bridge across California Creek, on the Telegraph road.

Brazil, Ind.—Plans and specifications have been received by Mayor Bubb for the Chestnut street bridge across the C., E. & I. Railroad Company's tracks at the cut two blocks south of Main street.

Buffalo, N. Y.—Bids will soon be requested for a 186 ft. iron bridge, 100 ft. wide, over the Erie Canal at Porter avenue. The designs have been prepared by the Buffalo Engineering Co. F. M. Sylvester, designing engineer, writes that it is not yet decided when bids for the work will be received. Plans have been sent to the State Engineer at Albany, and bids will be advertised for by the Superintendent of Public Works within four or five weeks.

Camden, N. J.—Proposals will be received by Samuel Jaquillard, Chairman of the Bridge Committee, until Dec. 11, for an iron bridge over Cooper Creek in Delaware Township.

Carbondale, Pa.—Walter Frick, city engineer, has prepared plans for four girder bridges, and bids will be asked in the spring.

Cheyenne, Wyo.—City Engineer Patten, of this city, will draw the plans and specifications for a wooden truss bridge at Hartville.

Fall River, Mass.—Plans are being prepared by City Engineer Borden for eight iron bridges which will be built in this city next year to abolish grade crossings.

Fernandina, Fla.—It is proposed to build a bridge at the Marsh road, and the Bridge Committee has taken steps to secure estimates of its cost.

Freeland, Mich.—The new bridge over the Tittabawassee River has been completed by the Wrought Iron Bridge Company of Canton, O. It has been inspected by the Bridge Commission and declared satisfactory.

Goldthwaite, Mills Co., Tex.—Commissioners' court at a recent regular session passed an order to build a steel bridge across Pecan bayou at what is known as the Jackson crossing.

Greenville, Mo.—The Wrought Iron Bridge Company, Canton, O., has been awarded the contract for building an iron bridge across the Sac River at $2,420.

Houston, Tex.—Bids will be received until Dec. 9 for constructing an iron bridge over Buffalo Bayou, at Shepherd's Dam. Address J. G. Tod, Houston.

Mr. B. R. Warner, Assistant City Secretary, writes that the contract for the iron drawbridge over Buffalo Bayou at Hill street has been awarded to the new Columbus Bridge Co., at $38,764.

Howland, Me.—The contract for a bridge across the Penobscot river has been awarded to Bearce & Clifford, of Lewiston, for about $40,000.

Johnstown, N. Y.—An estimate of the cost of a proposed bridge to span the Cayadutta Creek, on Bridge street, has been submitted by the City Engineer.

Laurel Springs, N. J.—A new highway bridge will have to be constructed to replace the one over the tracks of the Atlantic City Railroad, destroyed recently by fire.

Mason County, W. Va.—The West Virginia Bridge Company, of Point Pleasant, W. Va., completed a new steel highway bridge over Thirteen Mile Creek, in Mason County, last week.

New Brighton, Pa.—Press reports say that the opposition to the Congrade Bridge Company, which was granted a charter to build a bridge across the Beaver River at this place, has ceased, and the bridge will be built.

New York.—The new stone arch bridge on the Boston post road, over Mamaroneck Creek, between Mamaroneck and Rye Neck, has been completed. Its completion will make it possible to pass from one village to the other without making the long detour heretofore necessary.

Ottawa, Ont.—The Dominion government has offered the city to pay two-thirds the cost of building the proposed new iron bridge over the Rideau Canal and Canada Atlantic railroad crossing at Maria street. The total cost is placed at $30,000.

Oxford, Ind.—The bridge over Pine Creek is being repaired, but next spring it will be replaced by a new structure.

Peshtigo, Wis.—A bridge will be built across the Peshtigo, in the Upper Bush region, about three miles above the new Marinette road bridge.

Philadelphia, Pa.—The members of the finance committee of the city council, on Nov. 27, visited the

old Gray's Ferry bridge over the Schuylkill, and as a result of their investigation it was decided that a new bridge is a necessity at that point. An appropriation of $250,000 has been proposed on condition that the Pennsylvania Railroad Company, together with the Union Traction Company, will contribute $300,000 additional. The Traction Company does not at present cross the Gray's Ferry bridge, but it would be to its advantage to do so. However, if it pays for the privilege at the rate mentioned above, it will be something quite unusual in the history of street railroads and Philadelphia bridges. The proposed bridge is a double decked structure, the lower deck to be used for the railroad and the upper deck for a driveway. The present bridge is very old, having been built about 50 years ago by the Philadelphia, Wilmington & Baltimore Railroad. Trains are run over one side of it, the other side being for the accommodation of wagons and foot passengers. A board partition separates the two parts of the bridge.

Pittsburgh, Pa.—Press reports say that the large iron trestle on the McKeesport Division of the Pittsburgh & Lake Erie, from Homestead to Braddock, is to be double-tracked to facilitate the movement of heavy traffic. The bridge over the Monongahela at that point is also, it is said, to be double tracked.

Rock Island, Ill.—A double deck railroad highway bridge is being built across the Mississippi River at this point. It consists of two spans 258 ft., three 216 ft. 6¾ in., one 193 ft. 3 in., one 98 ft. 9 in., and a swing span of 365 ft. 7 in. Its total length is 1,845 ft. It is being built by the Chicago, Rock Island & Pacific and the United States Government, the latter paying three-fifths of the cost. The piers of the present bridge, which the new structure replaces, will be enlarged so as to accommodate a double track bridge 29 ft. c. to c., the roadbed being 26 ft. with two 6-ft. sidewalks on brackets, and upon these piers the new structure will be built. It extends from the west bank of the Mississippi to the island of Rock Island. The iron work will weigh about 5,000 tons. The double track railroad is to be carried on the upper deck, the headroom between the two decks being about 12 ft. The flooring of the upper deck will consist of the Pennsylvania Steel Company's solid floor trough sections. The draw span, which is to be operated by electricity, will weigh, it is estimated, about 2,600,000 lbs. The Chief Engineer is Mr. Ralph Modjeski, Chicago, Ill., the engineer for the Government being Col. A. R. Buffington, of the Engineer Corps, Rock Island Arsenal. The substructure is being built by Sooysmith & Co., working under a contract for the Phœnix Bridge Co., which has the contract for the entire work. The operating machinery will be made by George P. Nichols & Co., of Chicago.

Shawano, Wis.—Bonds have been voted to aid in building two iron bridges, one over Wolf River and one over Shawano Lake outlet.

Sigourney, Ia.—Bids will be received until Dec. 18 for building the small bridges required by the county for the year 1896. A. Stranahan.

Sioux City.—It is thought that the formal opening of the new Sioux City Short Line bridge over the Missouri River will take place on Feb. 1, 1896. The approaches are almost completed, and it is thought that the bridge will be ready for traffic by the middle of January, but some finishing work will be necessary which will postpone the opening until the date mentioned.

Springfield, Mass.—The Boston & Albany Railroad has been required by the county commissioners to alter the arch railroad bridge over Main street in Springfield, which leaks considerably upon the sidewalks and street below. The railroad entered a petition objecting to the proceedings requiring the above alteration, but their objection has been denied.

St. Paul, Minn.—The City Engineer has been instructed to prepare plans and specifications for an iron bridge over the tracks of the Great Northern on Snelling avenue.

Topeka, Kan.—We noted last week the vote in favor of issuing bonds to the amount of $150,000, for an arch bridge at Kansas avenue. The engineers, Keepers & Thacher, Detroit, Mich., write as follows concerning it: "The time for receiving bids for the Topeka bridge has not yet been fixed, and probably will not be for some little time yet, as drawings have not been made."

Troy, N. Y.—The Wrought Iron Bridge Company, Canton, O., has been granted until Jan. 15 for the completion of the iron work on the Rensselaer street bridge.

Washington, D. C.—The cost of rebuilding the long bridge over the Potomac at this place has been estimated at $531,365. General W. P. Craighill, Chief of Engineers, has recommended its construction. Only $157,000 can be secured for the fiscal year ending June 30, 1897.

Yuba City, Cal.—A 60-ft. bridge with a 16-ft. roadway will be constructed across the canal of the Live Oak Slough Protection District, at the Schlag place.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, $3 per share, payable Dec. 31

Columbus, Hocking Valley & Toledo, semi-annual, 2½ per cent. on preferred stock, payable Jan. 2.

Delaware & Hudson Canal, quarterly, 1¾ per cent., payable Dec. 16.

Philadelphia, Wilmington & Baltimore, semi-annual, 4 per cent., payable Jan. 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Pennsylvania & New Jersey, special, office of the company, southeast corner of Delaware and Federal streets, Camden, N. J., Dec. 19.

Rome, Watertown & Ogdensburgh, annual, company's office, New York, Dec. 28.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Mechanical Engineers will hold its annual meeting at the Society's rooms, 12 West Thirty-first street, New York City, Dec. 3 to 6.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Tuesday in each month, at 8 p. m. The headquarters of the society are at 1736-1739 Monadnock Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2:30 p. m., from October to May, inclusive, at its association rooms in Lincoln Hall, Ithaca, N. Y.

The Engineers' and Architects' Association of Southern California meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The Engineers' Society of Western New York holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Club of St. Louis.

A meeting was held on Nov. 20, 26 members and 8 visitors being present. The applications for membership of C. G. L. Barth, Richard Morey and A. W. French were approved by the Executive Committee. They were balloted for and elected.

Prof. W. B. Potter, chairman of the club's Committee on Smoke Prevention, then addressed the club explaining the steps which had brought about the present status of affairs in smoke abatement in St. Louis. The original agitation begun in the club had resulted in the passage of two ordinances which had been in force for over two years, and were operating satisfactorily. A Government official who had recently investigated the subject had reported that St. Louis had stopped 70 per per cent. of its smoke. Mr. Potter explained the methods of measuring smoke and suggested that Government observers keep records of the smokiness of the atmosphere on different days. He devoted special attention to the steam jet as a cheap remedy. He called attention to the fact that the personality of firemen entered more largely into this matter than any other single feature, and suggested that it would be well to license firemen. Many plants were defective in draught and had large air leakages. The attention which had been given the smoke problem had resulted in better boiler practice generally. The discussion was participated in by Messrs. J. B. Johnson, P. N. Moore, Flad, Olshausen, Meier, Sharman, Bryan and Kinealy.

American Society of Civil Engineers.

At the meeting of Nov. 20, 1895, the discussion of the paper by William Starling, M. Am. Soc. C. E., on "The Discharge of the Mississppi River," which was postponed from Nov. 6, 1895, was taken up. Written discussions were read by the Secretary from Messrs. Crowell, Charles H. Miller, Coppée, W. G. Price, J. B. Johnson and F. P. Spalding, and the subject was further discussed by Mr. John Thomson. A written discussion of the paper by Robert B. Stanton, M. Am. Soc. C. E., on "Notes on the Construction of a Water System for Placer Mining, and Suggestions for a New Method of Dam Building," by Mr. A. P. Davis, was read by the Secretary.

On the evening of Dec. 4, George Hill, Assoc. M. Am. Soc. C. E., presented a paper on "Tests of Fireproof Flooring Material," illustrating the subject with lantern slides.

At the meeting to be held Dec. 18, 1895, Thomas Egleston, M. Am. Soc. C. E., will address the Society on the subject of "An International Metric Gage." Dr. Egleston is the chairman of a committee appointed in May, 1895, by the American Meteorological Society, his colleagues being the President of the National Academy of Science, a former Director of the Coast Survey, the President of the Meteorological Society, and the Professor of Physics at Chicago University. He will explain what has been accomplished in this matter in other societies and before the Houses of Parliament in England, and it is hoped that a general discussion of the subject will be brought out.

Mr. Rudolph Hering will also address the Society on this evening on the subject of Asphalt Reservoir Linings, and will show some photographs and specimens of recent work, and any discussion had on this interesting and timely subject will be incorporated with that of the paper by Mr. R. B. Stanton when it is published.

TESTS OF FIRE-PROOF FLOORING MATERIAL.

The tests described in the paper were made by means of apparatus constructed specially for the purpose. A 15-in. I-beam, weighing 80 lbs. per foot and 7 ft. 9 in. long, was attached to the skewback beams, between which the arches were built, by two wrought-iron ties. A hydraulic ram was attached to the lower side of this beam, and, by forcing down its plunger, pressure was applied to the arch under test. The plunger had a stroke of 7 in. and a cross-section of exactly 50 sq. in. The ram could be moved along the beam to which it was attached, and was connected by copper pipe with the force pump by which the pressure was obtained. A set of three-pressure recording gages could be connected to the chamber of the ram; one gage had a range of 3,000 lbs per square inch, the second a range of 1,500 lbs., and the third a range of 400 lbs. The amount and the rate of application of the load were recorded automatically by these instruments, and it was only necessary to multiply the readings by 50, the area of the plunger, to obtain the total pressure exerted on the arch.

Tests are described as follows: Twelve to determine the strength of the Melan system of concrete-iron arches described in the *Transactions* of the Society, Vol. XXXI., page 438; 15 of tile arches with mortar joints, and 12 of tile arches without mortar, a little damp sand being used to bed the skewbacks of the side construction arches, and to even up the top for the planks used in applying the load.

The Melan arches had a span of 6 ft., and the ribs were either 3-in. T or 4-in. I sections, weighing 6.6 and 7 lbs. per foot, respectively. The rise at the crown with the I sections was 6.97 in., and 8.53 in. with the T sections. Considering the manner in which they were built, the author considers them of the same character as would be found in a building where a reasonable supervision was exercised. The first cracking or splitting in these arches occurred under loads of 27,000 to 35,000 lbs., and failure occurred under loads of 35,000 to 58,000 lbs.

The tests of the tile arches showed that the side construction type requires a skew block in which the inclined member on the line of the arch thrust runs back to a solid support against either the fillet or the flange of the skewback beam. The end construction arch requires good mortar and reasonably good bedding to make the joints which transmit the pressure adequate to their duty, the weak point being the mortar in the end joints. When well bedded, the end construction arch is very much the stronger.

PERSONAL.

—Mr. Wm. B. Clements has been appointed Traveling Passenger Agent of the Seaboard Air Line, with headquarters at Atlanta, Ga.

—Mr. E. H. Van Vleet, sales agent for the Coale Muffler & Safety Valve Co., of Baltimore, with office at 115 Broadway, New York, has resigned.

—Mr. J. M. Hannaford, General Traffic Manager of the Northern Pacific, according to a report from St. Paul, has been offered the First Vice-Presidency of the Erie Company. Mr. Hannaford has been with the Northern Pacific since 1872.

—Mr. Charles Kennedy, of Omaha, has been appointed General Eastern Agent of the Chicago, Rock Island & Pacific, with headquarters in New York. His present position is General Northwestern Passenger Agent. He succeeds Mr. Farnsworth at New York, the latter going to the Seaboard Air Line.

—Mr. A. B. Farnsworth has been appointed General Eastern Passenger Agent of the Seaboard Air Line, in charge of business in the Eastern and Middle States. Mr. Farnsworth has been with the Chicago, Rock Island & Pacific as General Eastern Passenger Agent of that company for the last twelve years.

—Mr. William Apps, formerly with the Illinois Central, has been appointed General Master Car Builder of the Canadian Pacific at Montreal. He succeeds Mr. John Higginson, who resigned a few weeks ago. Mr. Apps was in the car department of the Great Northern when Mr. Manvel was General Manager. He was afterward Master Car Builder of the Western of Alabama, and has also been with the Chicago & Eastern Illinois and with the Illinois Central.

—Captain H. M. Tatem, Secretary and Treasurer of the Cincinnati Southern and of the roads included in the old Queen & Crescent System, died at Cincinnati on Dec. 1. He was about 55 years old at the time of his death. For over 25 years he had been Secretary of the Cincinnati Southern, being appointed Secretary and Auditor of the Board of Trustees in July, 1869. He became Treasurer of the road in 1881, and later Treasurer of the Alabama Great Southern and the other roads operated as the Queen & Crescent system.

—Mr. Joseph Ramsey, Jr., assumed his new duties as General Manager of the Wabash Railroad on Dec. 1, earlier than was expected when his appointment to that office was announced. Mr. Hays, the retiring General Manager of the Wabash, does not take up his duties on the Grand Trunk until Jan. 1 but as he desired a few weeks of rest before going to Montreal he decided to retire from the Wabash the beginning of this month, enabling him to give some attention to his private business in St. Louis and to introduce Mr. Ramsey on the Wabash.

—Mr. Charles Wood, Chief Engineer of the Cincinnati, Hamilton & Dayton, died at Cincinnati on Nov. 28. He had been in the engineering department of the Cincinnati, Hamilton & Dayton since 1888, going to it as Assistant Engineer and being promoted to Chief Engineer in August, 1891. He was a graduate of the Massachusetts Institute of Technology, his first railroad work being on the surveys for the Minnesota & Northwestern. After that he was at the bridge works at Athens, Pa., as inspector of material for the Poughkeepsie bridge, going from there to railroad work again at Cincinnati.

—Mr. T. A. Mackinnon has been appointed First Vice-President of the Boston & Maine as well as General

Manager of that company, having authority over the operating and construction departments. Other important changes announced in the organization of the Boston & Maine are the appointment of Mr. W. F. Berry, now General Traffic Manager, to be Second Vice-President, continuing in charge of the traffic department. A third new office is that of Assistant General Manager, to which Mr. George F. Evans, at present Division Superintendent at Boston, has been appointed. The company also has a General Superintendent, that position being held by Mr. D. W. Sanborn. Mr. Mackinnon became General Manager of the Boston & Maine Railroad a few years ago, having formerly been on the Concord & Montreal as General Manager. He went to that company in 1890 from the Canadian Pacific, where he had been Master of Transportation and previously Division Superintendent. Mr. Berry, now a Vice-President, is one of the oldest officers on the Boston & Maine in time of service. He was with the old Eastern road for more than 20 years, when that line became consolidated with the Boston & Maine. He was then General Freight Agent, but was made Assistant General Freight Agent of the consolidated company, and some time later was promoted to be General Freight and Passenger Agent. In 1892 he became General Traffic Manager. Mr. Evans went to the Boston & Maine in March, 1892. For some years before that he had been with the Louisville, Evansville & St. Louis as General Manager, and in other positions.

—Mr. Patrick Sterling, Locomotive Superintendent of the Great Northern Railway, England, died on the morning of Nov. 11 at his residence in Doncaster. Mr. Sterling was in his 76th year, having been born at Kilmarnock in June, 1820, but notwithstanding his age he was still the active head of his important department of a great railroad. Indeed, the immediate cause of his death was pneumonia, the result of a cold caught on a visit to King's Cross Station on business. His father, the Rev. R. Sterling, D. D., was an ingenious man, inventor of the regenerative air engine, and Sterling was apprenticed under his uncle in the Dundee foundry, now owned by Urquhart, Linslay & Co. He worked for about nine years in this and other foundries, having had special opportunities to see heavy marine engine work. In 1846 he went to Neilson's Hyde Park Locomotive Works at Glasgow, where he became a foreman. In 1851 he was appointed Superintendent of a line eight or nine miles long on the River Clyde, and in 1853 became Locomotive Superintendent of the Glasgow & South Western Railway. Thirteen years later he went to the Great Northern where he became Locomotive Superintendent in 1866. He was one of the best known, we may say one of the most famous, of the old English locomotive superintendents. Up to the time of his death he held steadfast to his ideas of single drivers of large diameter and outside cylinders, and unquestionably his engines have shown speed, economy and endurance in a high degree. He was a very successful department chief, and was highly esteemed not only by his directors, but by the workmen under him. One of his sons, Patrick, was his assistant at Doncaster; another one is on the North Eastern Railway; still another is Locomotive Superintendent of the Hull & Barnsley, and his brother, James Sterling, is Locomotive Superintendent of the South Eastern.

—Col. Aldace F. Walker, of Chicago, was elected Chairman of the Board of Directors of the new Atchison, Topeka & Santa Fe at a meeting of the Reorganization Committee in New York, on Monday of this week. Mr. Walker, as one of the receivers of the company, has had his headquarters in Chicago, but when he takes up his new duties as Chairman it will be necessary for him to be in New York, and his office will probably be removed from Chicago by the first of the year. It will be remembered that Mr. Walker became Receiver of the Atchison Company in August a year ago, soon after the resignation of Mr. Reinhart as Receiver. He was a member of the first Board of Interstate Commerce Commissioners appointed by President Cleveland in 1887. The opinions written by him showed him to have a broad-minded grasp on the questions which came up before him for hearing and soon brought him into prominent notice. He resigned before his term expired to become Chairman of the Interstate Commerce Railway Association, which was organized at New York in 1889. He remained in that position and as Chairman of the successor association, the Western Traffic Association, until its termination in Oct., 1892. On Nov. 1 of the same year, he was elected Chairman of the Joint Committee, composed of the Presidents and Vice Presidents of railroads, members of the Trunk Line and Central Traffic Associations. He resigned this position in Oct., 1893, and resumed the practice of law at Chicago until his appointment as Receiver of the Atchison. Mr. Walker was born in West Rutland, Vt., in 1842. He was graduated from Middlebury college in 1862 and immediately enlisted in Company B, First Artillery, 11th Vermont Volunteers, being elected first lieutenant. He served through the war and was mustered out with his command in 1864 with the rank of lieutenant-colonel. He then completed his studies at the Columbia Law School and practiced law in New York City from 1867 to 1873, when he removed to Rutland, Vt., where he continued the practice of law and was counsel for many important railroads, banks and corporations. He was a member of the Vermont State Senate in 1882 and held the position of chairman of the Judiciary Committee of that body. In 1887 he was appointed one of the two Republican members of the Interstate Commerce Commission.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—The names of the new directors were announced this week as follows: Edward J. Berwind, New York; Benjamin P. Cheney, Boston; H. Rieman Duval, Thomas P. Fowler, Edward N. Gibbs, George G. Haven, R. Somers Hayes and Victor Morawetz, 29 Nassau street, all of New York; George A. Nickerson, Boston; Edward P. Ripley, Chicago; William Rotch, Boston; Aldace F. Walker, Chicago, and Charles S. Gleed, C. K. Holliday, and T. A. Osborn, of Topeka. Mr. Walker is Chairman. Executive Committee: The President, the Chairman, Mr. Cheney, Mr. Fowler, Mr. Gibbs, Mr. Hayes and Mr. Morawetz.

Boston & Maine.—The following changes in the organization of the company's official staff have been approved by the Board of Directors, and became effective December 1: T. A. MacKinnon is now First Vice-President and General Manager, with authority over the operating and construction departments; W. F. Berry, Second Vice-President, with authority over the traffic departments; George F. Evans, Assistant General Manager, and W. G. Bean, Superintendent of the Southern Division, all with offices in the Union Station, Boston. Mr. Henry C. Robinson has been appointed Assistant Superintendent of the Southern Division, with office at Boston.

Brunswick & Western.—The annual meeting of the stockholders was held in Brunswick, Ga., this week, the following directors being elected: H. B. Plant, M. F. Plant, R. G. Erwin, B. F. Newcomer, E. B. Haskell, C. P. Goodyear and D. F. Jack. At the meeting of the directors the following officers were elected: President, H. B. Plant; Vice-President, M. F. Plant; Secretary, R. B. Smith; Treasurer, J. M. Lee.

Cheraw & Darlington.—John H. McIver having resigned the office of Secretary and Treasurer of this company, C. C. Olney has been elected Secretary and Treasurer in his stead, with office located at Charleston, S. C.

Choctaw, Oklahoma & Gulf.—C. F. Higgins has been appointed General Superintendent; J. W. Evans, Trainmaster; J. C. Blaine, Chief Dispatcher, and J. J. McCarthy, Roadmaster of the road, with headquarters at South McAlester, I. T., vice J. Bradford, Superintendent; F. L. Moeller, Superintendent Transportation; H. G. Knapp, Chief Dispatcher, and P. Bryne, Roadmaster, resigned.

Erie.—The Erie Railroad Company, as the successor of the New York, Lake Erie & Western Railroad Company, took over the property of that company on Nov. 30. The election of the following officers by the new Directors, on Nov. 14, was announced, some having been previously reported: E. B. Thomas, President; Andrew Donaldson, Third Vice-President; G. G. Cochran, Fourth Vice-President; Stetson, Tracy, Jennings & Russell, General Counsel; J. A. Middleton, Secretary; Edward White, Treasurer, and J. T. Wann, Auditor. The following appointments are also announced: C. R. Fitch, General Superintendent, Erie Railroad Division; A. M. Tucker, General Manager, N. Y., P. & O. Railroad; A. E. Mitchell, Superintendent of Motive Power W. Lavery, Assistant Superintendent of Motive Power; C. W. Buchholz, Chief Engineer; A. Mordecai, Assistant Chief Engineer; D. I. Roberts, General Passenger Agent, and E. B. Sheffer, Purchasing Agent.

Lexington & Eastern.—The following Board of Directors was elected at the annual stockholders' meeting: H. C. McDowell, J. D. Livingston, A. P. Humphrey, George Copland and Arthur Cary. Subsequently a meeting of the Board of Directors was held, at which the old officers were re-elected as follows: H. C. McDowell, President; J. D. Livingston, Vice-President and General Manager; Arthur Cary, Secretary and General Solicitor; George Copland, Treasurer and Auditor, and Charles Scott, General Freight and Passenger Agent.

Louisville, Evansville & St. Louis—I. N. Munson has been appointed Suderintendent of Bridges and Buildings, vice W. R. Damon, resigned, Office, Huntingburg, Ind.

Edwin Sample has been appointed Commercial Agent at Evansville, Ind., in charge of both freight and passenger business, vice P. E. Tichenor, resigned.

Richmond, Fredericksburg & Potomac.—The stockholders held their annual meeting at Richmond, Va., on Nov. 27. Major E. T. D. Myers was re-elected President, and the following Directors were chosen: Messrs. H. Walters, B. F. Newcomer, W. J. Leake and Moncure Robinson. Hon. J. Taylor Ellison was announced as State Director.

Savannah, Florida & Western.—The new board of directors elected last week is as follows: H. B. Plant, President; J. H. Estill, H. M. Flagler, M. F. Plant, R. G. Erwin, B. F. Newcomer and M. K. Jessup. The board will meet to elect officers some time this month.

Southern Pacific.—The offices of Assistant Controller and of Auditor of Disbursements have just been created. The latter officer is to have immediate charge of the disbursement accounts of the road west of El Paso. Pay rolls and vouchers are to be audited by him, and he is to see that the accounts of all disbursing officers, pay rolls, vouchers, etc., are prepared in proper form and distributed to the proper accounts. The office of General Auditor on the Pacific System has been abolished, and Mr. E. C. Wright, who held that office, has been made Auditor of Disbursements. The office of General Auditor Atlantic System has been changed to Auditor Atlantic System.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Bellefonte Central.—The extension from State College to Pine Grove Mills, Pa., is taking definite shape. The right of way has been recorded and part of the grading completed. The extension will go through a rich farming and mineral country, and there are possibilities of a further extension into Stone Valley, in Huntingdon County, at present not reached by railroads.

Bellefonte & Clearfield.—A charter was granted at Harrisburg to this company on Tuesday of this week, the company's capital being $1,100,000. The line will be constructed from a point near Milesburg, in Centre County, Pa., to a point near Clearfield in Clearfield County. The length of the road will be 55 miles. The President is Charles W. Wilhelm, of Reading, and the Directors are James Harris, David M. Butts, L. T. Munson, John J. Walsh, and Henry Breckerhoff, of Bellefonte, and A. V. Hoyt, of Phillipsburg.

Canadian Pacific.—The statement is periodically printed that the Canadian Pacific is to utilize the Crow's Nest Pass route in Southern British Columbia for a new main line across the Rocky Mountains, and that work will begin immediately. The Crow's Nest Pass would afford a route much lower than that now used by the Canadian Pacific, and a line built over this route would shorten the distance between Winnipeg and Vancouver many miles. However, there is no present intention of building through this pass, and the matter rests in the same position that it has since the pass was discovered and its advantages realized by preliminary surveys. The possibility of constructing the several hundred miles of new road, which will be necessary to get all the advantages which the new route would afford, is still very far off.

Charles King, of Tacoma, Wash., has been awarded the contract for building a narrow gage road from Trail Landing to Rossland, B. C., at a contract price approximately $100,000. Work has already been begun. The new line will be used to haul ore from the Trail Creek mines to the smelter in course of erection at Rossland in the new mining region of Southern British Columbia.

Centralia & Chester.—Work on the extension of the road from Salem, Ill., is now well under way and a large force is working south of the B. & O. S. W. track at Salem. The work will be pushed as fast as possible south to Centralia. Superintendent Schmidt thinks that trains will be running on the line by February next.

Charleston, Clendennin & Sutton.—The contract for the completion of this line from Clay Court House, W. Va., to Sutton, the terminus of the proposed line, will be let during the coming month. The road is almost completed from Charleston to Clay Court House, and for most of that distance is in operation.

Dallas Terminal.—The differences between the Missouri, Kansas & Texas and the Dallas Terminal Railway & Union Depot Company have been practically settled by mutual arrangement. The Missouri, Kansas & Texas will move its tracks on Broadway 5 ft. eastward, that the Terminal line may have ample right of way, and resume track laying without the interference of the authorities of Dallas.

Des Moines & Kansas City.—The litigation over the ownership of this road has been settled by the filing of decrees in the Federal Court, at Des Moines, last week. The present owners took the property under foreclosure from the Des Moines, Iowa & Southern, and now secure title to the property. The cases were brought to set aside the sale under foreclosure. The settlement now made is a compromise. Now that the controversy is ended, the plans to extend the line from Cainsville, Mo., its present terminus, to Kansas City may be carried out.

Kansas City, Pittsburgh & Gulf.—According to the local papers at St. Joseph there is some possibility of an extension of this road to that town. The plan outlined is to use the Kansas City & Atlantic tracks to Smithville, 20 miles north of Kansas City, and build from Smithville to St. Joseph, a distance of 30 miles, thus saving 14 miles between Kansas City and St. Joseph. The shortest route at the present time is the Kansas City, St. Joseph & Council Bluffs, the distance being 64 miles.

Lake Superior & Ishpeming.—F. G. Winston and E. T. Winston, of St. Paul, who have the contract for building this new road between Marquette and Ispheming, Mich., have had most of their construction outfit carried to Marquette. S. S. Noff, the Chief Engineer of the railroad company, has established a line between Marquette and Ishpeming with a maximum grade of 86 ft. per mile. The maximum curvature of the road will be five degrees. The road will be constructed in a substantial manner. The weight of rail to be used will average 80 lbs. to the yard. The bridge across Dead River will be a steel structure, having three towers, two of which will be 100 ft. in height. The ore dock will have 200 pockets, and will be of the most modern construction.

St. Louis, Cape Girardeau & Fort Smith.—Mr. Louis Houck, the Receiver and President, states that as soon as the reorganization of the company is completed, it is proposed to extend the road through the famous zinc region of Arkansas, by way of Harrison to Fort Smith.

Tifton & Northeastern.—Mr. Arthur Pew is now making a survey for an extension of this road from its present terminus, 15 miles northeast of Tifton, Ga., for a distance of about 12 miles. The extension is to reach land being settled by Northern immigrants, the place being known as "Old Soldiers' Colony."

Wheeling & Connellsville.—At a meeting of the Chamber of Commerce of Wheeling, W. Va., held this week, the construction of this line was under consideration. It was decided that the County of Ohio, in which Wheeling is located, should raise $500,000 by issuing bonds, and that as much more might be raised along the proposed route. It was decided to ask the County Commissioners at the next meeting to submit the matter to a vote of the people. The sentiment in the city and county is favorable to the enterprise, and it now seems in a fair way to be pushed through. Committees were appointed to look after the details of the work. The history of the project was recently given in these columns.

Electric Railroad Construction.

Buffalo, N. Y.—By a unanimous vote the Board of Aldermen, last week, promised to give the Buffalo Traction Company a franchise for its system of lines in this city. Tom L. Johnson, of Cleveland, is at the head of the new company.

Cincinnati, O.—The College Hill Electric Street Railroad began running cars last week to this city. The route is seven miles in length, and the through fare eight cents.

Horseheads, N. Y.—Engineers have begun the survey for the electric road between Montour Falls and Horseheads, N. Y. Gen. Mulford, President of the road, has secured almost the entire right of way. The road will follow the towpath of the old canal to below Millport, where it will take the highway through that village and then again return to the towpath and follow it to Horseheads. The work of building the road will be commenced early in the spring, and it is expected to have it in operation by June 1. It is estimated that the cost of building the entire road will be $200,000.

Indianapolis, Ind.—Work on the Indianapolis & Greenwood electric railroad is being pushed vigorously. About two miles of the roadbed have been graded, all the work done being between Southport and Greenwood. The railroad goes up the Madison road to the north side of Lick Creek, where it turns northeast and strikes Shelby street, near the city limits, coming up to Washington street by way of Virginia avenue. Mr. Grafton Johnson, of Greenwood, is President of the corporation. The power house and offices will be at Greenwood, Ind.

Lorain, O.—The County Commissioners recently granted a franchise to the East Lorain Street Railroad Co. to extend its lines across the viaduct over Black River in this city.

Middletown, Md.—The grading for the Frederick-Middletown Electric Railroad was begun last week between Braddock Heights and Catocting Mountain.

New Haven, Conn.—The officials of the New York, New Haven & Hartford are considering the advisability of substituting electric power for steam on the Meriden, Waterbury & Cromwell, a branch road about 30 miles in length, from Waterbury to the Connecticut River at Cromwell. The road is one of the leased lines of the New England road, and extends through an important manufacturing district, which, however, is reached by other lines of the New Haven.

Philadelphia.—The Union Traction Company assumed control last Sunday of all the electric railroads in Philadelphia, except the Heatonville, Mantua & Fairmount Passenger Railroad.

Cars began running this week on that portion of the Philadelphia & West Chester Electric Railway extending from Llanerch to Newtown Square. Until other arrangements are made, the dummy trains will be run on the three miles of railroad between Philadelphia and

Llanerch, a right to erect poles at a certain point being still in dispute. The power house and car sheds of the company are located at the latter place.

Wapakoneta, O.—The promoters of the electric line from Lima via Wapakoneta and St. Marys to Piqua, a distance of about 50 miles, have now completed their survey, and contracts for grading the route and constructing the line are being considered.

Yonkers, N. Y.—The Yonkers Trolley Railroad Company has begun the work of laying a continuation of its tracks to connect with the Union Railway Company, of New York, which extends from Kingsbridge to Yonkers.

GENERAL RAILROAD NEWS.

Central of Georgia.—A syndicate was formed last week by Harvey Fisk & Sons, of New York, to take the unsubscribed first mortgage bonds of this company, amounting to $6,500,000, the public subscriptions to the $16,500,000 of the first mortgage bonds, recently offered in the market, having amounted to only $10,000,000, leaving the $6,500,000 for which provision is now made by this syndicate. These bonds, it was later announced, have been sold in Europe.

Galveston, Houston & Henderson.—The long contest carried on in the courts by the Missouri, Kansas & Texas, the owner of all the stock of the company, for the return of the property from the International & Great Northern, and the abrogation of the lease to that road, has been ended by an agreement for the joint use of the road by the two companies. Under this agreement the Missouri, Kansas & Texas secures a line into Galveston, the object which it has had in view. The Galveston, Houston & Henderson road extends from Houston to Galveston, and gives an outlet at tidewater on the Gulf. The terms of the compromise provide that the Missouri, Kansas & Texas shall transfer to the International & Great Northern 4,999 shares of the capital stock of the Galveston, Houston & Henderson, being one-half of the total amount of the capital stock of the Galveston, Houston & Henderson Company, less one share, the M., K. & T. retaining 4,999 shares and the two remaining shares being placed with some person agreed upon by both the contending roads, in order to secure the strict and impartial execution of the terms of the agreement. In consideration of this transfer of stock the I. & G. N. surrenders the 99-year lease made in 1883, by which it secured exclusive possession and control of the G., H. & H. property and franchises, to be canceled and abrogated. The agreement further stipulates that both the International and M., K. & T. shall enter into a joint contract with the G., H. & H., identical in every detail, for the use of the road between Houston and Galveston. Under this amicable arrangement the two roads will begin at once a joint operation of the G., H. & H. track between Houston and the Gulf. The formal agreement which brings this long contest, which has been before the courts for three years, to a close, has been submitted to the Texas Railroad Commission at Austin and has received its approval.

Illinois Central.—By a practically unanimous vote, the stockholders at the special meeting in Chicago, Nov. 26, authorized an increase of $10,000,000 in the capital stock of the company, or from $50,000,000 to $60,000,000. It is proposed to raise this additional $10,000,000 by a new issue of 100,000 shares of $100 each. Stockholders of record on Oct. 19 have the privilege of subscribing at par for one of the new shares for every five shares owned. The proceeds of $7,500,000 of the $10,000,000 to be raised will be used to purchase the remaining securities of the Chesapeake, Ohio & Southwestern road. The balance of the money is to be used for the Lake Front improvements or other purposes.

Marietta & North Georgia.—This road, 209 miles, extending from Knoxville to Marietta, Ga., was sold at foreclosure sale at Marietta on Nov. 25 for $956,500. The purchasers are the Car Trust and Investment Company, of Philadelphia. The upset price was $700,000. Several previous attempts had been made to sell the property.

Mobile & Girard.—This road, which was sold at public auction at Girard, Ala., last week, under a decree of foreclosure, was bid in by J. T. Davies, of New York. His bid was $1,000,000. The line is 133 miles long and extends from Columbus to Seabright, Ala.

Northern Pacific.—Controller John Scott has issued a financial statement which shows that the company's gross earnings in October were $2,707,935; operating expenses, $1,145,055, and net earnings, $1,562,879, an increase of $379,950.

Oregon Short Line & Utah Northern.—The last report of the results of operation by the receivers to the United States Court gives the surplus on July 31 as $587,918. The report says: The net earnings of the Oregon Short Line Division are estimated by the receiver to be $110,827 for August, 1895, and the net earnings for September, 1895, are estimated to equal the amount stated for August, and including such estimates the amount of surplus upon such statement on Oct. 1, 1895, was $809,573. Deducting the amount just paid for February, 1895, coupon with interest thereon, and on August, 1895, coupon to date of payment, in all, $480,000, there remains, according to the Master's report of the surplus on Oct. 1, 1895, $329,000. To this sum must be added the surplus earnings for October and November, which should equal $220,000, making in all $549,000 to credit of Short Line Division as of Dec. 1, 1895, less such taxes as may have been paid since Oct. 1. The amount of August, 1895, coupon, with interest to date, is about $459,000.

Richmond, Fredericksburg & Potomac.—The company reports earnings for the year ending June 30, as follows:

	1895.	1894.	Changes
Gross earn	$711,803	$674,345	I. $37,458
Oper. exp	467,738	443,153	I. 24,585
Net earn	$244,065	$231,192	I. $12,873

Rio Grande Southern.—The reorganization of the company has been completed, and the road was taken out of the hands of the court and the Receiver on Nov. 30. Mr. E. T. Jeffery, who was Receiver, has been elected President of the company. The reorganization has been most successful, inasmuch as $4,507,000 out of a total of $4,510,000 bonds have accepted the plan of a 3 per cent. bond for three years from January 1, 1895, and 4 per cent. thereafter to maturity. The expenses of the reorganization have been less than one-half per cent. on the entire issue. The net earnings of the road at present are nearly double the amount of interest and all other charges.

Roanoke.—The North Carolina Railroad Commission has declared this road to be a common carrier and decided to put it on the assessment list, under the objections of the company. The road, which is operated under the name of the Roanoke Railroad & Lumber Co., has been hauling freight and passengers, to a limited extent, recently, it seems, and last week the Railroad Commissioners cited President R. S. Cohen to show cause why the road should not be assessed as a common carrier for taxation. President Cohen testified that his contractor hauled the freight and passengers without his knowledge and against his orders; but the Commissioners decided that the road was now a common carrier and put it on the assessment list. It extends from Portsmouth, Va., to Princeville, N. C.

Savannah, Florida & Western.—At the annual meeting of the stockholders of this road, held last week at Savannah, Ga., directors for the ensuing year, as named elsewhere in this paper, were elected, and the report submitted showed the earnings to be $3,560,457; expenses, $1,069,565—leaving a surplus of earnings of $1,069,-565. The above figures show a decrease in the surplus earnings of $200,000, which the officials attribute entirely to the frost weather in Florida last winter, which seriously affected freight shipments over the road to the East.

Southern Central (Pa.)—This line, projected to run from Harrisburg through the counties of Dauphin, Perry and Snyder to Sunbury, a distance of over 50 miles, was sold by the Sheriff at Harrisburg, Nov. 30, to Ex-Congressman Simon P. Wolverton, of Sunbury, acting in the interests of the Philadelphia & Reading, the chief creditor, for $400. J. F. Campbell, of Philadelphia, was the only other bidder. About the only real work done on the line was some grading between Harrisburg and Rockville, four miles.

Tennessee Midland.—Judge Linton, at Memphis, has confirmed the sale of this road, and the Paducah, Tennessee & Alabama, to J. W. Phillips, of St. Louis, representing New York interests, made last month in foreclosure proceedings, when some description of the lines was published in these columns.

Wheeling & Lake Erie.—The annual report of the company for the fiscal year ending June 30 makes the following comparisons:

Gross earn	$1,353,825	I.	$65,241
Oper. exp	995,444	I.	142,250
Net earn	$358,381	D.	$77,009
Other income	93,430	I.	14,367
Total income	$451,811	D.	$62,642
Interest and taxes	418,068	I.	6,424
Surplus	$33,743	D.	$69,066
Previous surplus	118,415	I.	102,809
Total surplus	$152,158	I.	$33,743

Electric Railroad News.

Baltimore, Md.—The Columbia & Maryland Railroad has given a mortgage to the Central Trust Co., of New York, to secure $6,000,000 of bonds.

Frederick, Md.—The Frederick & Middletown Electric Railway Co. has elected officers as follows: President, George W. Smith; Vice-President, D. Edward Kefauver; Secretary, Dr. U. A. Sharretts; Treasurer, Herman L. Routzatin. The Board of Directors consists of all the officers and Charles H. Coblentz, Peter H. Bussard, Peter W. Schafer, C. V. S. Levy and Thomas H. Haller.

New York.—The New York & Harlem Railway Company has, as an experiment, put two cars equipped with storage batteries on the Astoria Ferry crosstown line.

Ottawa, Ill.—The Ottawa Electric Street Railway was sold last week to the General Electric Co. of Chicago for $7,500. The railroad, which is seven miles long, was built six years ago.

Pottstown, Pa.—The Pottstown & West Chester Electric Railway has been organized by President John P. Robinson, of Philadelphia, and others to build a line between Pottstown and West Chester, 22 miles. Starting from South Pottstown, it will run by way of Bucktown, Pughtown, West Vincent, Eagle Hotel, Lionville, to West Chester.

Reading, Pa.—All lines operated by the Reading Traction Co. at present, including the Black Bear line and the Reading & Womelsdorf Railway, will be merged into the United Traction Co., and application for a charter for the new organization will be made on Dec. 17. The names of the incorporators are William R. McIllvain, Henry C. England, James A. O'Reilly, Samuel E. Rigg and Oliver S. Geiger. The company will be capitalized at $400,000.

Richmond, Va.—The Richmond Traction Co. has negotiated a mortgage of $500,000 in Baltimore to complete its road.

TRAFFIC.

Traffic Notes.

The Lehigh Valley recently took 1,600 loaded freight cars out of Buffalo in one day.

The Indianapolis, Decatur & Western, in connection with the Toledo, St. Louis & Kansas City, has put on a through night passenger train between Indianapolis and St Louis; and as the fare between these cities over this line is two dollars less than over the older lines the traffic managers of the latter are beginning to complain.

Boats carrying about 15,000,000 bushels of coal went down the river from Pittsburgh Nov. 27 and 28, but nearly as much more coal was left behind for lack of tug boats. The boats which went down had considerable difficulty from low water and a number of large barges were sunk. It is said that no more boats can be started until more rain falls.

The October freight movement of 134,669 cars through the Pennsylvania yards at Harrisburg broke the best previous record. The November movement has now broken the October record by 2,274 cars, or 136,943 in all. Of this great movement, which is a daily average of 5,267 cars, 80,312 cars were loaded. This is about the number of loaded cars in October.

The Washington & Southwestern vestibuled limited train of the Southern Railway now runs through, solid, between New York and Atlanta, and there are sleeping cars between Jersey City and New Orleans, Jersey City and Memphis, Jersey City and Hot Springs, N. C., and Jersey City and Tampa via Savannah and Jacksonville. Dining cars serve all meals between New York and New Orleans.

The United States District-Attorney at San Francisco has filed application to be made a party to the suit of the Southern Pacific Company against the California Railroad Commission, which was recently brought to restrain the enforcement of the reduction in freight rates recently ordered by the Commission. It is said that the claims of the United States Government will be: first, that the rights of the Federal Government are supreme; second, that under the Thurman act the Government has the right to regulate all the affairs of the Central Pacific; third, that the Southern Pacific is bound to pay the United States 25 per cent. of the gross earnings of the Central Pacific annually, and that no state commission has any right to prevent early liquidation of this debt. Various other cognate arguments will be used.

Chicago Traffic Matters.

CHICAGO, Dec. 4, 1895.

The General Passenger Agents, after having been in session for practically two weeks, have finally come to an agreement regarding transcontinental passenger business, and have formed a new association, to be known as the Transcontinental Passenger Association. The agreement has been signed by the following companies: Atchison, Atlantic & Pacific, Burlington & Missouri River, Canadian Pacific, Central Pacific, Chicago, St. Paul, Minneapolis & Omaha, Colorado Midland, Rock Island, Denver & Rio Grande, Galveston, Harrisburg & San Antonio, Great Northern, Missouri Pacific, Minnapolis, St. Paul & Sault Ste. Marie, Missouri, Kansas & Texas, Northern Pacific, Oregon Railway & Navigation Co., Rio Grande Western, St. Louis & San Francisco, Southern Pacific (Atlantic and Pacific systems), Southern California, Texas & Pacific and Union Pacific. The headquarters of the new association will be located in this city, and the traffic embraced in the agreement covers all transcontinental passenger traffic controlled by members of the Association located in territory west of and including a line drawn from Port Arthur, through Duluth, Minneapolis, St. Paul, Sioux City and Missouri River, to Kansas City, thence to St. Louis, Memphis, New Orleans and Galveston. Mr. B. D. Caldwell, Chairman of the Western Passenger Association, has been elected Chairman of the Transcontinental Association as well. The agreement covering transcontinental business removed the only remaining objection to the formation of an agreement covering what is known as trans-Missouri business, and all passenger business west of Chicago has now been placed in the hands of Chairman Caldwell. This result has been reached only after conferences which have been practically continuous for eight months, and the Western lines are much encouraged over the prospect of a resumption of regulated traffic and the maintenance of agreed rates in all Western territory.

A meeting of general managers of eastbound roads has been called to be held here to-morrow, at which it is expected that arrangements will be made for putting in operation the machinery of the new traffic agreement, so far as it relates to Central Traffic Association territory.

The Southern Pacific has announced its willingness to become a member of the Immigrant Clearing House of the Western lines provided it receives a satisfactory division of the business. The matter has been referred to a special committee, and the probabilities are that an agreement will be reached.

Considerable friction has recently developed among the eastbound roads in regard to the old question of cartage allowances. Some of the roads are charged with paying excessive allowances, and the matter is scheduled for the meeting to-morrow.

By agreement between the Alton and the State Railroad Commissioners, the suit against that company for the violation of the order of the Board regarding stock yard switching charges, will be tried at Springfield, and it is expected that it will come up at the January term of the Circuit Court.

Considerable feeling has developed among the Eastern roads over the permission given the New York, Chicago & St. Louis to run a special excursion to New York, Dec. 2, at a round trip fare of $18. It is surmised that permission was given the Nickel Plate to run this excursion for the purpose of evening up its percentages under the eastbound agreement. Some of the other lines, however, are apparently of the opinion that no evening up process was necessary, and have petitioned for permission to run similar excursions.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending Nov. 30, amounted to 58,312 tons, against 74,505 tons during the preceding week, a decrease of 16,193 tons, and against 34,182 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO NOV. 30.		WEEK TO NOV. 23.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	8,102	13.9	9,745	13.1
Wabash	3,417	5.9	5,192	6 9
Lake Shore & Mich. South.	9,384	16.1	13,046	17.5
Pitts., Ft. Wayne & Chicago	5,158	8 8	8,018	10·8
Pitts., Cin., Chi. & St. Louis.	6,411	11.0	7,104	9 6
Baltimore & Ohio	6,538	11.2	6,270	8.4
Chicago & Grand Trunk	3,001	5 2	6,854	9.2
New York, Chic. & St. Louis	7 953	13.7	7,321	9.8
Chicago & Erie	5,099	8.7	7 836	10 5
C., C., C. & St. Louis	3,216	5.5	3,119	4.2
Totals	58,312	100.0	74,505	100.0

Of the above shipments 2,711 tons were flour, 27,952 tons grain and mill stuff, 11,929 tons cured meats, 7,575 tons dressed beef, 1,031 tons butter, 1,530 tons hides, and 3,560 tons lumber.